PROJECT PLAN FOR
UNDERGROUND TANK INVESTIGATION
NAVAL STATION TREASURE ISLAND,
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

VOLUME I: WORK PLAN

SEPTEMBER 16, 1988

Prepared by:

IT CORPORATION

Submitted by:

HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
MARTIN MARIETTA ENERGY SYSTEMS, INC.
OAK RIDGE, TENNESSEE 37931

for:

U.S. DEPARTMENT OF ENERGY
CONTRACT DE-AC05-84OR21400

Submitted to:

DEPARTMENT OF THE NAVY
WESTERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
SAN BRUNO, CALIFORNIA 94066-0720

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LIST OF ACRONYMS

CGI - Combustible Gas Indicator
CIH - Certified Industrial Hygienist
CPR - Cardio Pulmonary Recussitation
DA - District Attorney
DHS - Department of Health Services
DOT - Department of Transportation
Energy Systems - Martin Marietta Energy Systems, Inc.
EPA - Environmental Protection Agency
HAS - Health and Safety
HPA - Hunters Point Annex
HSO - Health and Safety Officer
IAS - Initial Assessment Study
IDLH - Immediately Dangerous to Life and Health
IT - International Technology Corporation
LEL - Lower Explosive Limit
LUFT - Leaking Underground Fuel Tank
MSDS - Material Safety Data Sheet
MSL - Mean Sea Level
NIOSH - National Institute for Occupational Safety and Health
OSHA - Occupational Safety and Health Administration
PCB - Polychlorinated Biphenyls
PEL - Permissible Exposure Levels
QA/QC - Quality Assurance/Quality Control
RWQCB - Regional Water Quality Control Board
SCBA - Self Contained Breathing Apparatus
SCF - Standard Cubic Foot
THV - Threshold Limit Value
WestDiv - Western Division

1.0 INTRODUCTION

1.1 PURPOSE AND OBJECTIVES

This work plan is for the performance of an underground tank investigation at Naval Station Treasure Island, Hunters Point Annex, San Francisco, California. The purpose of this investigation is to assess the site and prepare specifications for the removal of the underground tanks located on the Hunters Point Annex.

Specific objectives of this investigation are:

- Identification/confirmation of tank locations and tank contents.
- Determination of leaking tanks through the use of soil gas survey or soil borings.
- Characterization of tanks found to be leaking.
- Preparation of plans and specifications for the removal of non-leaking tanks.
- Preparation of plans and specifications for the removal of leaking tanks.

1.2 WORK PLAN ORGANIZATION

This work plan is organized as follows:

Volume I:	Work Plan
Volume II:	Sampling Plan
Volume III:	Quality Assurance/Quality Control (QA/QC) Plan
Volume IV:	Health and Safety Plan

2.0 BACKGROUND

2.1 SITE DESCRIPTION

Naval Station Treasure Island, Hunters Point Annex (HPA) is in southeastern San Francisco at the tip of a peninsula extending eastward into San Francisco Bay (Figure 2-1). The Navy property encompasses a total of 965 acres; of these, 522 acres comprise the on-land facilities, with the remaining area a portion of San Francisco Bay. The facility is bounded on three sides by San Francisco Bay and on the fourth by the Hunters Point district, which consists of both public and private residential housing and commercial/industrial buildings.

The northern and eastern shores of HPA are developed for ship repair and equipped with drydock and berthing facilities. No shipping facilities are present along the southern shore, which consists primarily of emplaced fill.

Approximately 70 to 80 percent of the lands within HPA consist of relatively level lowland areas that were constructed by placing fill along the bay margin. The remaining area is a moderately sloping ridge in the northwestern portion of the site. Elevations across the site (in feet above Mean Sea Level, MSL) range from about 6 to 10 feet in the lowlands to about 176 feet on the ridgecrest. Substantial cut and fill grading of the ridge occurred in the past to generate material for filling the lowland areas and construction of building pads.

Surface drainage appears to be primarily unconcentrated sheet-flow runoff that is collected by on-site storm sewer systems and discharged into San Francisco Bay. Extensive grading and construction of HPA has filled or modified any pre-existing drainage channels and no naturally occurring, channelized drainage crosses the facility.

2.2 SUBSURFACE CONDITIONS

2.2.1 Geology

The geologic logs of numerous borings and wells installed at HPA have aided in developing an understanding of the subsurface stratigraphy of the site. Four geologic units underlie the site. The oldest unit is bedrock of the Franciscan Complex. This unit is overlain in some areas by undifferentiated sedimentary deposits consisting of consolidated sands and clays, which are in turn overlain by estuarine deposits of clay, silt, sand, and peat, termed "bay mud." In several areas, artificial fill has been placed over the bedrock and/or the bay mud.

The Franciscan Complex bedrock is a tectonic assemblage of igneous and sedimentary rock that accumulated at the western margin of North America between 50 and 150 million years ago. Franciscan rocks have been extensively deformed during their long geologic history, giving rise to a chaotic assemblage of variably sized blocks on sandstone, greenstone, shale, chert, and serpentinite, which are often bounded by ancient, inactive faults or shear zones. Serpentinite is the dominant bedrock type at HPA and constitutes a block that trends northwest and extends to Fort Point. The potential variability in rock types and structure within the Franciscan Complex can create highly variable geologic and hydrogeologic properties over relatively short distances.

Along the southwest margin of the site, prior studies encountered stiff clays and dense sands overlying bedrock. These units are tentatively correlated with the "Undifferentiated Sedimentary Deposits" of Bonilla (1971) and may be equivalent to the Colma Formation of Quaternary age (past 2 million years). Insufficient data are currently available to determine whether this unit is present at depth in other locations of the site.

Within the San Francisco Bay estuary and over much of HPA the bedrock and undifferentiated sedimentary deposits are blanketed by bay mud. These estuarine deposits accumulated during approximately the last 11,000 years and reach thicknesses of about 50 feet in some portions of HPA (Lowney/Kaldveer, 1972). The bay muds generally consist of soft, saturated plastic silts and clays with interbedded sand and peat. In many areas of the bay, the soft younger bay mud deposits grade into stiff silts and clays termed "older bay mud." While older bay mud deposits may be present in the offshore areas of HPA, insufficient test boring data are available to differentiate the older bay mud from the underlying undifferentiated sedimentary deposits.

Consequently, all of the stiff soils logged beneath the younger bay mud are collectively grouped with the undifferentiated sedimentary deposits.

Development of HPA has involved construction of fills over both bedrock and bay mud. Within the shipyard, fill is estimated to cover about 70 to 80 percent of the area, with bedrock exposed in the central upland area. The fill consists of two general types. The first type is material derived predominantly from excavation of bedrock to create level areas for shipyard activities. These fills vary in composition from those dominated by serpentinite and associated untramafic rocks to mixtures of serpentinite and Franciscan sandstone, chert, greenstone, and shale. The second type consists of mainly sandblast waste. In the early to mid-1940s, the Navy began placing these fills along the bay margin, primarily as a means to dispose of these materials.

The site has experienced strong ground shaking as the result of several historical earthquakes. These include the 1906 San Francisco Earthquake on the San Andreas Fault (Richter Magnitude 8.3) and earthquakes in 1836 and 1868, centered on the Hayward Fault (Richter Magnitude 7.0). Strong ground shaking at HPA is likely in the future. However, there are no historical accounts of surface fault rupture within the site, nor are any active faults known to traverse the site.

2.2.2 Hydrogeology

Few data are currently available regarding the local hydrogeology at HPA. Ground water occurs within the unconsolidated fill and alluvial materials and probably also occurs within the fractured bedrock underlying the site. The depth to water in the unconsolidated materials ranges from 2 to 12 feet below ground surface, while the depth to water within the bedrock is unknown. In general, ground water beneath the site probably flows radially from inland areas of higher elevation toward the bay. However, local ground water flow directions may be quite complex due to variations in topography and the hydraulic properties of subsurface fill materials. In some areas, local flow directions may also vary temporarily due to the influence of tidal fluctuations of the bay and localized recharge from storm events.

2.3 SITE HISTORY

Naval Station Treasure Island, Hunters Point Annex was operated as a commercial dry dock facility from 1869 until December 29, 1939, when the property was purchased by the Navy. Following the purchase, the facility was leased to the Bethlehem Steel Company until December 18, 1941. On that date, the Navy took possession of the property and began operating it as a shipyard where naval ships and submarines were modified, maintained, and repaired. In addition, HPA was used for personnel training, limited radiological operations, research and development, and design of ships, and also provided nonindustrial services to Navy personnel and their families.

According to a July 1969 survey (WESTEC, 1984), there were 397 buildings used for industrial purposes and 57 buildings used for nonindustrial purposes at HPA. These facilities were distributed into three functional areas:

> Basic Industrial Production Area - This area was located in the northern and eastern portion of the shipyard and included the waterfront and shop facilities. The waterfront facilities consisted of 24,000 linear feet of pier, quay wall, and wharf space. There were forty 500-foot-long deep-water berths (twenty-one of which were fully equipped), six dry docks of various sizes, a regunning pier, and a crane support structure.
>
> Industrial Support Area - This area was located in the central and southwestern portion of the shipyard. These facilities included those operations, such as supply and public works, that provided support services to the industrial production activities.
>
> Nonindustrial Area - This area was located in the northwestern and southern portions of the shipyard. The facilities included barracks, officer's quarters, and recreational facilities. Most of the disposal areas are also located in the southern portion.

In late 1975, the Navy's shipyard operations ceased and the property was placed under the control of the Navy's Office of the Supervisor of Shipbuilding, Conversion, and Repair, San Francisco (SUPSHIP-San Francisco).

In May 1976, most of HPA was leased under a five-year lease to Triple A, which operated it as a commercial ship repair facility. In addition, portions of the facility were subleased by Triple A to private warehousing, industrial, and commercial firms. In June 1981, Triple A's lease was extended for a second five-year term. This extension expired in June 1986, at which time the

Navy began proceedings to retake possession of the property. Following actions taken by the San Francisco District attorney (DA), Triple A vacated the facility in mid-1987.

Activities by both the Navy and Triple A were related to ship repair, maintenance, and construction. As a result, similar materials were used by both including paints, solvents, fuels, acids and bases, metals, polychlorinated biphenyls (PCBs), and asbestos. Information on waste generation and disposal by the Navy is presented in the Initial Assessment Study [IAS (WESTEC, 1984)], which covered the period from 1941 through 1974. Information on the activities of Triple A from 1976 to 1987 has been developed by the DA (DA, 1986). No data are currently available regarding activities prior to 1941 (when the Navy took possession of HPA) or activities by Triple A's sublease holders. The history of waste generation and disposal at HPA is described below according to activities performed by the Navy (1941 to 1974) and activities performed by Triple A (1976 to 1987).

Storage Tanks

Between 1942 and 1974 there were approximately 45 above ground and buried storage tanks at HPA. A list of tank numbers, tank type, capacity, location, and contents is provided in Table 3. Since 1975, 13 tanks have been removed. The IAS described only one set of tanks in detail. This Tank Farm is located north of Robinson Street and currently consists of ten above ground storage tanks, including one 184,150-gallon steel diesel tank, eight 12,000-gallon steel diesel tanks, and one 12,000-gallon steel lube oil tank. In addition to its use by the Navy, the Tank Farm was used by Triple A for storage of diesel and lube oil. Only one spill or leak has been confirmed (by the IAS) for either buried or above ground tanks at HPA; in the early 1940s, one of the 12,000-gallon diesel tanks ruptured and its contents overflowed the Tank Farm berm area. The spilled oil was apparently cleaned up and placed in the Oil Reclamation Ponds. Also at the Tank Farm is an area from which eight 3000-gallon horizontal, steel tanks were removed. The ground surface in that area is stained, apparently from leaks.

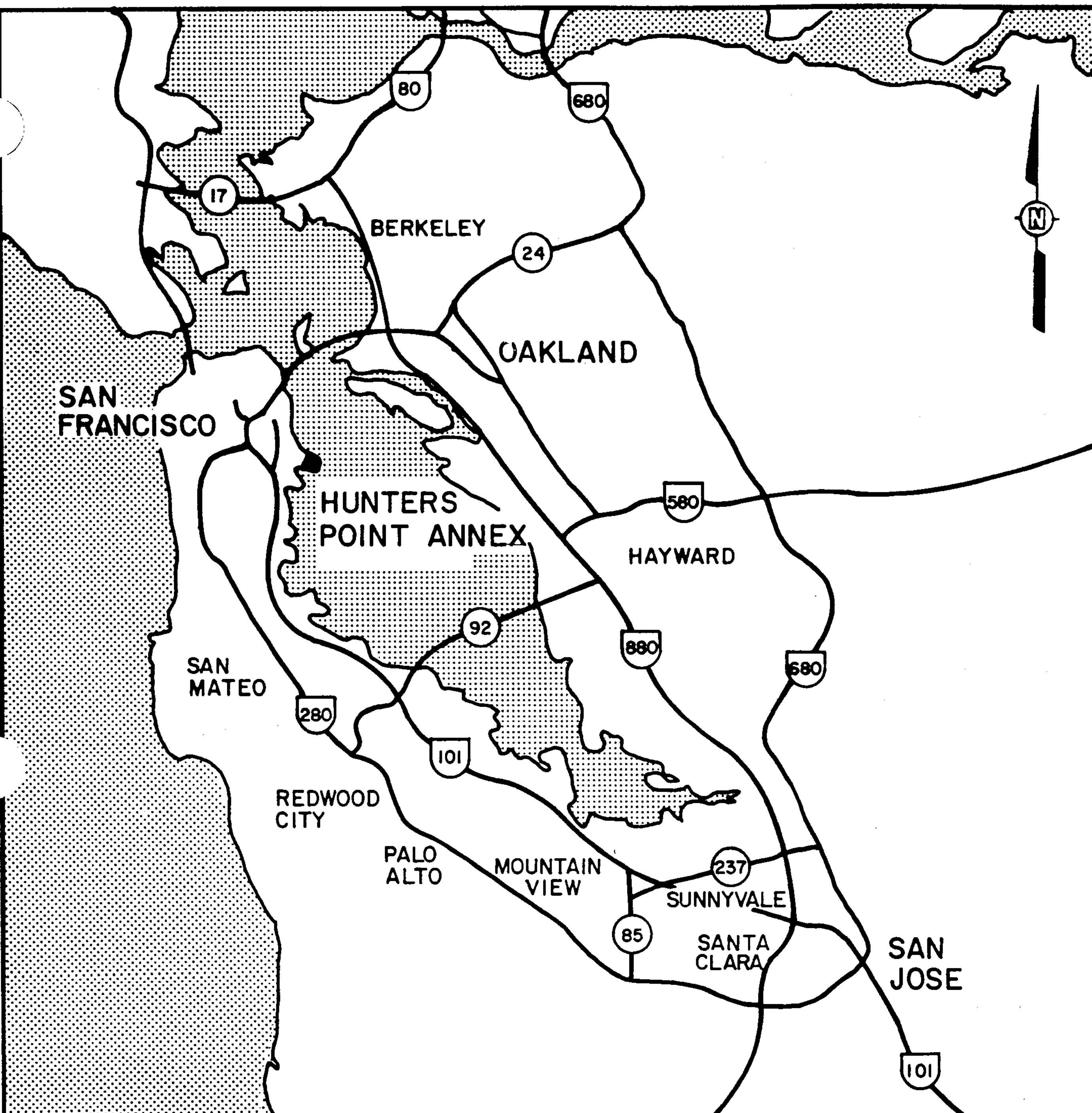

FIGURE 2-1

SITE LOCATION MAP

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NAVAL STATION TREASURE ISLAND,
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

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126076

3.0 UNDERGROUND TANK INVESTIGATION

3.1 PURPOSE AND OBJECTIVES

The purpose of this Work Plan is to examine the existing conditions at the underground tank locations identified in the statement of work (Table 3-1, Figure 3-1). IT Corporation will conduct these activities under the management direction of Martin Marietta Energy Systems, Inc. (Energy Systems). This plan is responsive to the requirements of the U.S. Navy, Western Division (WESTDIV) Naval Facilities Engineering Command, the organization responsible for the related activities at Naval Station Treasure Island, Hunters Point Annex. All other environmental concerns not directly related to the underground tanks are being addressed separately by the Navy.

3.2 SCOPE OF WORK

The initial investigation of the underground tanks at HPA will involve the identification of tanks and tank contents. This identification process will consist of several steps. The first step will be a review of all available maps and drawings related to the underground tanks. This will provide information regarding the location of the tanks and any nearby underground utilities. An interview of personnel currently on previously assigned to HPA will be conducted to gather information of the underground tanks. The interviews will focus on: any known or suspected spills on leaks from the tanks, tank history, maintenance and previous uses of the tanks. Upon completion of the records search and personnel interviews, a geophysical survey will be performed to determine the exact location of each tank and its associated piping. The geophysical survey will include techniques such as magnetics and ground penetrating radar. On-site conditions will dictate the specific type of geophysical technique used.

Each tank will be sampled for free or floating product. A sample which is indicative of the thickness of the floating product in the tank will be collected. Once a determination is made as to the amount of free product in a tank, a representative sample of the tank contents will be taken using a dedicated PVC bailer. Details of the sampling procedures and equipment are presented in Section 4.1, Volume II, Sampling Plan.

The liquid contents of all tanks will be sampled for laboratory analysis. Samples from similar tanks in a tank group will be composited if the liquid contents of these tanks are also similar. Assuming all 26 tanks contain liquid, a total of 20 samples (including three composited samples from nine tanks) will be sent to the laboratory for characterization analysis.

The next step will involve soil gas testing and soil borings to determine which tanks or tank groups have leaked. Soil gas testing will be conducted for all tanks or tank groups containing volatile compounds (gasoline, paint thinner) (Table 3-1). This procedure will not be used for tanks containing non-volatile compounds (i.e., fuel oil and diesel). A PHOTOVAC TIP I (TIP) will be used for the survey. The methodology for the soil gas survey is discussed in Section 4.2 of the Sampling Plan, Volume II.

Subsurface soil samples, obtained from exploratory borings, will be collected around those tanks containing non-volatile compounds (Table 1-1). These samples will be taken from shallow borings drilled at locations near tanks containing non-volatile compounds. Two borings will be drilled near each tank or tank group. Approximately 30 borings are planned. Exact locations will be determined on the basis of proximity of adjacent structures, buried utilities, and the ground water hydraulic gradient in the area, if known. Details of the drilling method are presented in Section 4.3 of Volume II, the Sampling Plan. Details on the soil sampling collection and handling procedures are presented in Section 4.6 of Volume II, the Sampling Plan.

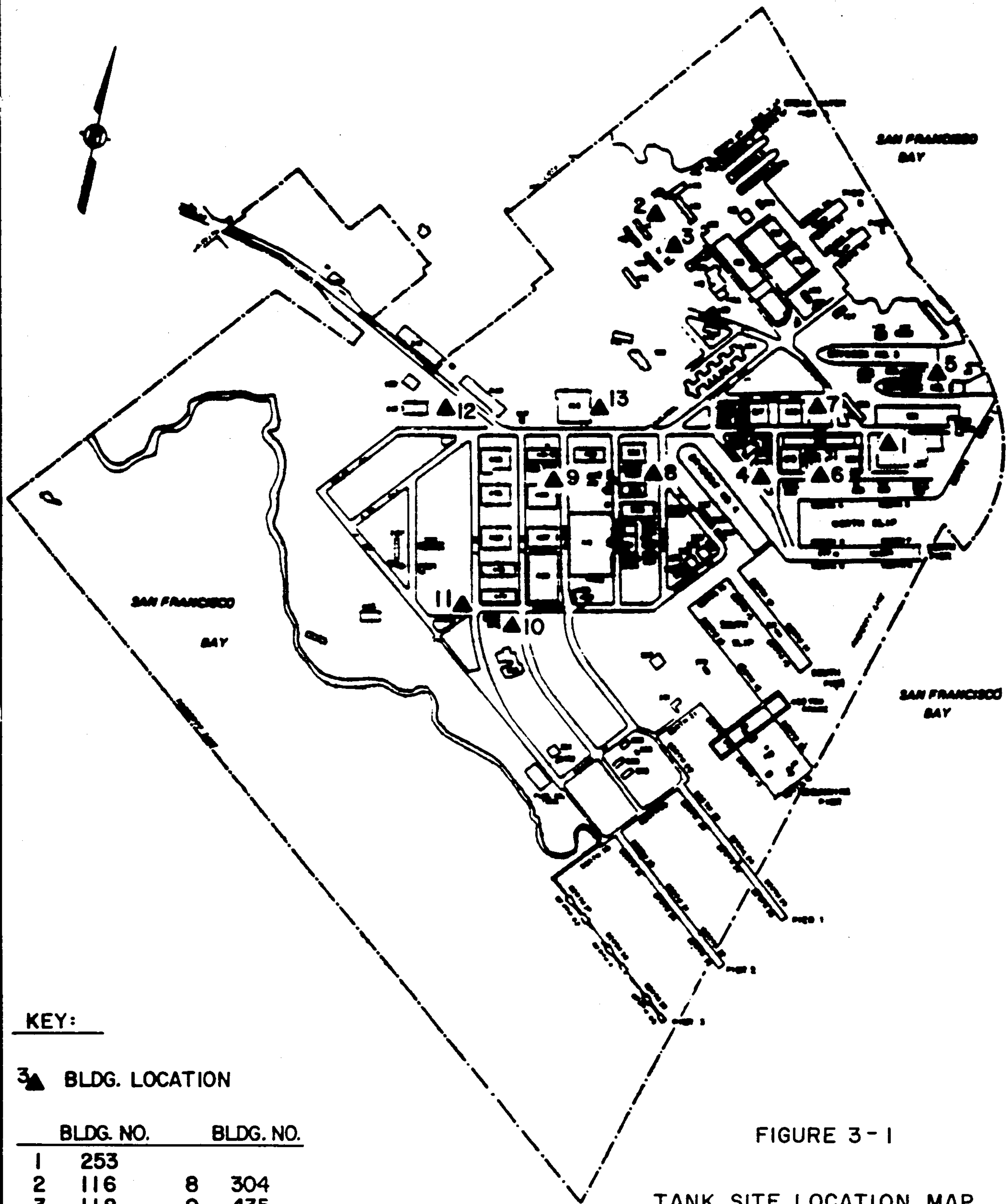
Once a determination is made regarding which tanks or tank groups have leaked, a characterization of the leaking tanks, to determine the horizontal and vertical extent of contamination, will take place. This characterization will involve a supplemental soil gas survey around tanks suspected of leaking volatile compounds. The supplemental soil gas survey will be performed in the same manner as the initial soil gas survey. A series of soil borings and ground water monitoring wells will be installed, and soil and water samples collected and analyzed, at selected locations near leaking tanks or tank groups to determine the amount and extent, both vertically and laterally, of soil and ground water contamination. Background soil and water samples will also be collected and analyzed. Details of monitoring well construction methods and ground water sampling are presented in Sections 4.4 and 4.7 of Volume II, the Sampling Plan.

The exact number and location of the supplemental soil gas survey and monitoring wells will depend on the number of tanks or tank groups found to be leaking.

The final steps of this underground tank investigation will involve preparation of plans and specifications for the closure of non-leaking tanks. These plans and specifications will meet Navy procurement requirements and include cost estimates and schedules. Plans and specifications for the removal and remediation of tanks or tank groups found to be leaking will also be prepared. The plans and specifications will be written in accordance with The Guidelines for Addressing Fuel Leaks published in September, 1985 by the California Regional Water Quality Control Board, San Francisco Bay Region. The plans and specifications will also address the concerns of the California Administrative Code (Titles 22 and 23), the city and county of San Francisco Health and Fire Departments, and the Bay Area Air Quality Management District. Finally, technical consultation will be provided to Martin Marietta Energy Systems and the Navy during tank removal and/or remediation.

TABLE 3-1
UNDERGROUND TANKS AT
HUNTERS POINT ANNEX

TANK NO.	LOCATION	GALLONS	CONTENTS	TYPE
S-001	Bldg. 253	3,000	Gasoline	Steel
S-002	Bldg. 253	3,000	Gasoline	Steel
S-003	Bldg. 253	3,000	Gasoline	Steel
S-004	Bldg. 253	3,000	Gasoline	Steel
S-135	Bldg. 116	1,250	Fuel Oil	Steel
S-136	Bldg. 118	750	Fuel Oil	Steel
S-209	Bldg. 203	210,000	Fuel Oil	Concrete
S-211	Bldg. 203	3,000	Fuel Oil	Steel
S-212	Bldg. 203	4,500	Fuel Oil	Steel
S-213	Bldg. 203	35,000	Treated Water	Concrete
S-214	Bldg. 205	21,924	Fuel Oil	Steel
S-215	Bldg. 270	25,320	Paint Thinner	Steel
S-251(1)	Bldg. 251	Unknown	Unknown	Unknown
S-251(2)	Bldg. 251	Unknown	Unknown	Unknown
S-304	Bldg. 304	6,880	Gasoline	Steel
S-305	Bldg. 304	6,880	Gasoline	Steel
S-435(1)	Bldg. 435	Unknown	Unknown	Unknown
S-435(2)	Bldg. 435	Unknown	Unknown	Unknown
S-508(?)	Bldg. 500	750	Fuel Oil	Steel
S-711	Bldg. 709	5,000	Gasoline	Steel
S-712	Bldg. 709	5,000	Gasoline	Steel
S-713	Bldg. 709	5,000	Gasoline	Steel
S-714	Bldg. 709	5,000	Diesel	Steel
S-801	Bldg. 811	10,800	Diesel	Steel
S-802	Bldg. 811	6,880	Fresh Water/ Diesel	Steel
S-812	Bldg. 813	10,000	Fuel Oil	Steel



KEY:

3▲ BLDG. LOCATION

BLDG. NO.		BLDG. NO.	
1	253		
2	116	8	304
3	118	9	435
4	203	10	500
5	205	11	709
6	270	12	811
7	251	13	513

SCALE

0 1000 2000 FEET

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FIGURE 3-1

TANK SITE LOCATION MAP

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NAVAL STATION TREASURE ISLAND
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

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CHECKED BY	SJZ	4-29-88	DRAWING NUMBER
APPROVED BY			

126076

4.0 ORGANIZATION

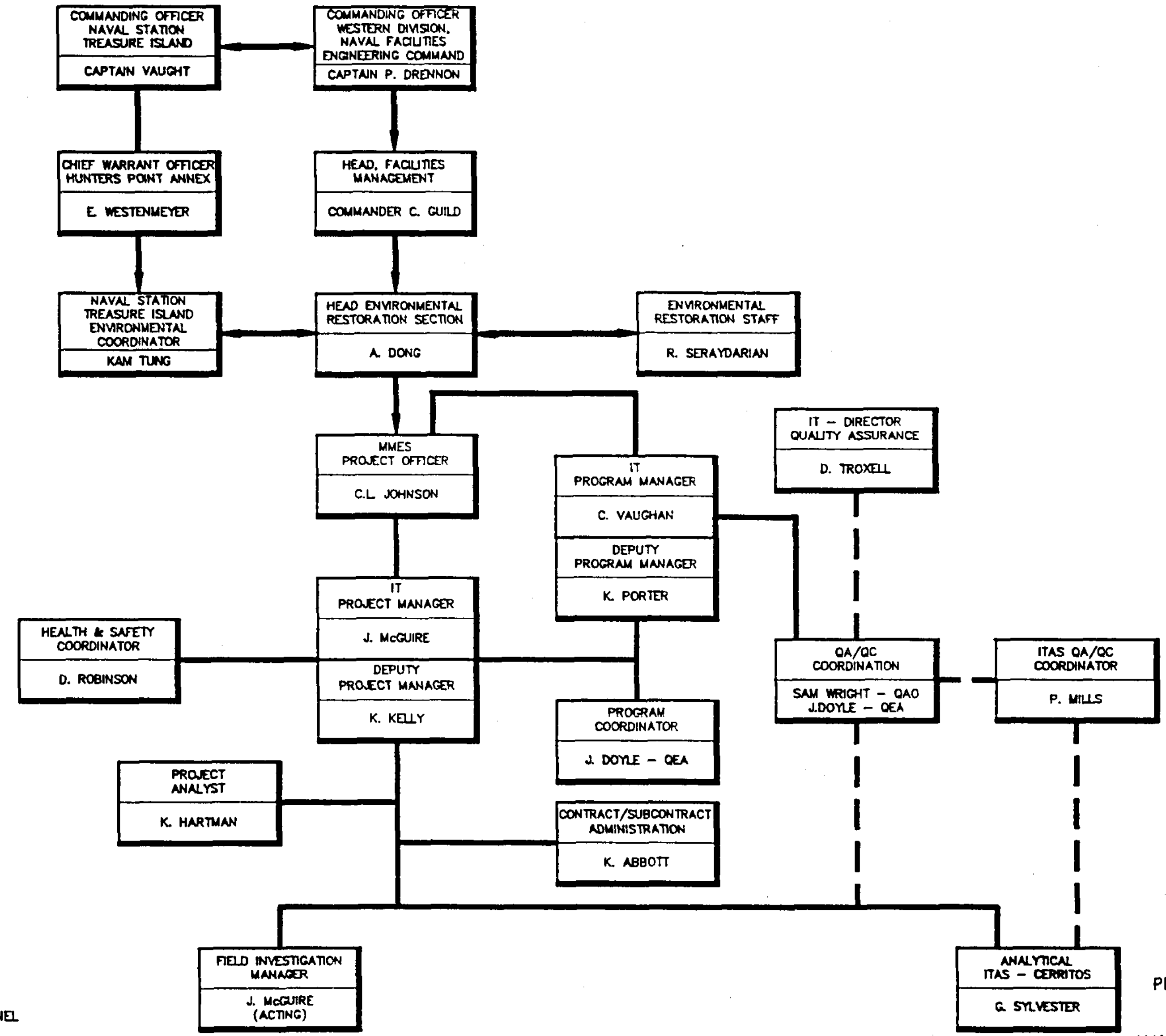
This underground tank investigation is being conducted by Martin Marietta Energy Systems, Inc. and its subcontractor, IT Corporation (IT), for Western Division Naval Facilities Engineering Command through an interagency agreement (IAG No. 1791-1791-A1) with the U.S. Department of Energy. The Western Division Naval Facilities Engineering Command is located in San Bruno, California; Martin Marietta Energy Systems is located in Oak Ridge, Tennessee. IT Corporation will manage its efforts from Martinez, California. Laboratory support will primarily come from IT's Cerritos, California laboratory. IT's Knoxville Tennessee office will also lend support for this project.

Two key subcontractors to IT will also provide support:

Quality Engineering Associates, Oak Ridge, Tennessee:
Quality Assurance/Quality Control coordination

Maxima, Inc., Oak Ridge, Tennessee:
Data base management and ecological assessment.

The key personnel and project organization are shown on Figure 4-1.



LEGEND :

- • = KEY PERSONNEL
- M = MAXIMA
- QAO = QUALITY ASSURANCE OFFICER
- QEA = QUALITY ENGINEERING ASSOCIATES
- ITAS = IT ANALYTICAL SERVICES
- ——— = DIRECT LINE OF RESPONSIBILTY
- — — = LINE OF COMMUNICATION

FIGURE 4–1

PROJECT ORGANIZATION CHART

PREPARED FOR

NAVAL STATION, TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

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DRAWING NUMBER 409617–B2

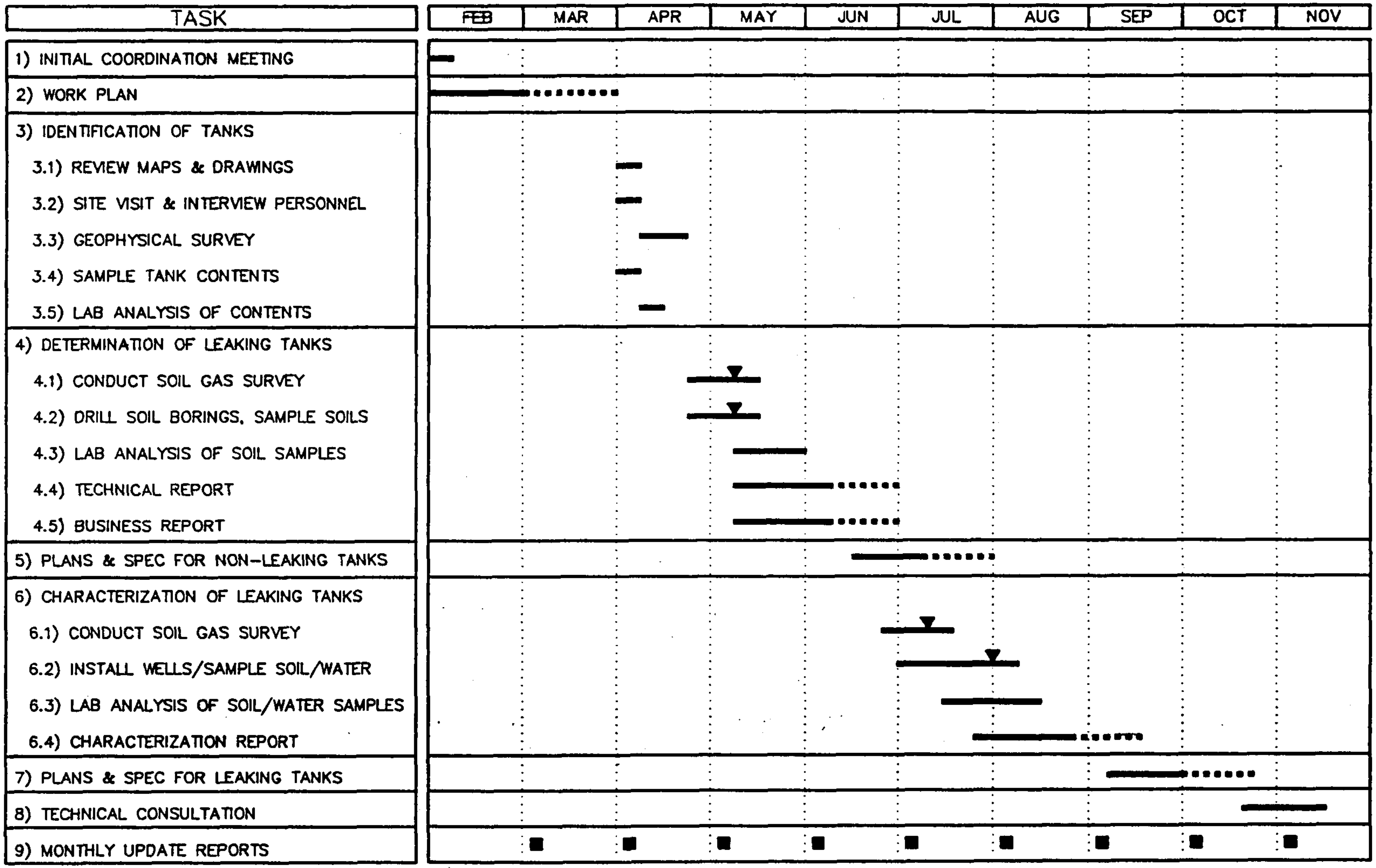
DRAWN BY J.A.C. 4–29–88

CHECKED BY

APPROVED BY

5.0 SCHEDULE

The schedule for conducting the underground tank investigation, as described in this project work plan, is shown in Figure 5-1. This schedule does not allow for any major delays that unforeseen circumstances might cause. This schedule is subject to the approval of the regulatory agencies.



LEGEND:

- ▬▬ LABOR INTENSIVE ACTIVITY
- ■■■■■■ INTERMITTENT AND/OR FOLLOW-UP WORK
- ▼ END OF FIELD WORK
- ■ MONTHLY UPDATE REPORT
- * SUBJECT TO THE APPROVAL OF THE REGULATORY AGENCIES

FIGURE 5-1
TENTATIVE PROJECT SCHEDULE *
PREPARED FOR
NAVSTA, TI, HUNTERS POINT ANNEX
SAN FRANCISCO, CA.

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DRAWN BY J.A.C. 4-28-88 | CHECKED BY SAW 4/28/88 | APPROVED BY SAW 4/28/88 | DRAWING NUMBER 409617-B1

6.0 REFERENCES

Bonilla, M.G., 1971, Preliminary Geologic Map of the San Francisco South Quadrangle and Part of the Hunters Point Quadrangle, California, United State Geological Survey Miscellaneous Field Studies Map MF-311, 1:24.000.

Lowney/Kaldveer Associates, 1972, Foundation Investigation, Water Pollution Abatement Facilities, Hunters Point Naval Shipyard.

WESTEC Services, Inc., 1984, Initial Assessment Study, Hunters Point Naval Shipyard (Disestablished), San Francisco, California, October, 1984, Contract No. N62474-83-C-6972.

PROJECT PLAN FOR
UNDERGROUND TANK INVESTIGATION
NAVAL STATION TREASURE ISLAND,
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

VOLUME II: SAMPLING PLAN

September 16, 1988

Prepared by

IT CORPORATION

Submitted by:

HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
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MSDS - Material Safety Data Sheet
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OSHA - Occupational Safety and Health Administration
PCB - Polychlorinated Biphenyls
PEL - Permissible Exposure Levels
QA/QC - Quality Assurance/Quality Control
RWQCB - Regional Water Quality Control Board
SCBA - Self Contained Breathing Apparatus
SCF - Standard Cubic Foot
THV - Threshold Limit Value
WestDiv - Western Division

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this sampling plan is to document the scope of work and the sampling and laboratory analysis procedures that will be used to investigate existing conditions at the underground storage tank locations identified in the statement of work document. IT Corporation (IT) will conduct these activities under the management direction of Martin Marietta Energy Systems, Inc. (Energy Systems). This plan is responsive to the requirements of the U.S. Navy, the responsibility of the Western Division (WESTDIV) Naval Facilities Engineering Command for the Navy Storage Tank Investigation Program, related activities at Naval Station Treasure Island, Hunters's Point Annex (HPA)

The scope of this sampling plan encompasses all field sampling and related activities, as well as laboratory analyses, required to assess the extent, if any, of environmental contamination resulting from the operation of the subject underground storage tanks. The implementation of this sampling plan will provide the data necessary to ensure that the requirements of the underground storage tank investigation are satisfied.

This plan has been prepared to address the following documents:

- California Regional Water Quality Control Board, San Francisco Region, 1985, "Guidelines for Addressing Fuel Leaks," September.
- State of California, 1985, "California Administrative Code, Title 23, Chapter 3, Subchapter 16, Underground Tank Regulations," August.
- California State Water Resources Control Board, Leaking Underground Fuel Tank (LUFT) Manual, December 1987.

This sampling plan is Volume II of the four-volume Project Plan. The remaining three volumes are:

Volume I Work Plan
Volume III Quality Assurance/Quality Control Plan
Volume IV Health and Safety Plan.

1.2 PROJECT DESCRIPTION

HPA, located in southeastern San Francisco at the tip of a peninsula extending eastward into San Francisco Bay (Figure 1-1), was disestablished by the U.S. Navy in June 1974. In 1976 most of the Navy-owned property at Hunters Point was leased to Triple A Machine Shop, Inc., which operated the facility as a commercial shipyard. WESTDIV has identified 26 underground storage tanks to be investigated under this project. These tanks are listed in Table 1-1. This project will assess the environmental contamination resulting from the operation of the underground storage tanks and will develop plans and specifications for tank removal, and remediation of tank sites. The ultimate objective of this activity is to bring the tank sites into compliance with the closure regulations under California Administrative Code, Title 23, Chapter 3, Subchapter 16, Underground Tank Regulations.

1.3 SITE DESCRIPTION

HPA Naval Shipyard covers approximately 965 acres. The land portion of the property comprises about 572 acres, with the remaining 393 acres located in San Francisco Bay. The peninsula on which the facility is located is bounded on the west by the Bay View/Hunters Point districts of San Francisco. These districts are developed with residential housing and commercial/industrial buildings.

Approximately 25 percent of the facility land area, located in the north-western portion of the site, is comprised of a moderately to steeply sloping bedrock ridge. The remaining 75 percent of the land area has been constructed over the years by placing fill along the bay shore. Much of the material used for construction of the fill areas was obtained by grading the ridge. Site ground surface elevations vary from about 6 feet above Mean Sea Level (MSL) in the lowland fill areas to about 176 feet on the ridge.

Any pre-existing, natural surface drainage channels that may have been present have been eliminated by the extensive grading that accompanied development of the facility. Today surface drainage is mainly in the form of sheet-flow runoff that is collected by the facility storm sewer system and discharged into San Francisco Bay.

1.4 SITE GEOLOGY

Past investigations have identified four geologic units underlying the site. The oldest of these is bedrock of the Franciscan Complex. In some areas bedrock is overlain by undifferentiated sedimentary deposits consisting of consolidated clays and sands. This unit is overlain by the Younger Bay Mud, which consists of estuarine deposits of clay, silt, sand, and peat. Finally, the fourth unit, present throughout much of the site, is an artificial fill that was placed over the bay mud and, in some places, over bedrock.

Bedrock at the site is composed of faulted and sheared blocks of sandstone, greenstone, shale, chart, and serpentinite. There are no known active faults on the site. The variability of rock type and structure can be expected to result in highly variable geologic and hydrogeologic properties over relatively short distances.

Except for the exposed ridge, much of the bedrock at the facility is overlain by stiff clays and dense sands. Harding Lawson Associates (1988) tentatively correlates these materials with the "Undifferentiated Sedimentary Deposits" noted by Bonilla (1971). They also point out that there is insufficient data to distinguish between these soils and the stiff silts and clays of the Older Bay Mud that are also likely present on site.

The undifferentiated sedimentary deposits are covered by the soft silts and clays known as the Younger Bay Muds. These geologically recent estuarine deposits reach thicknesses of up to approximately 50 feet in some portions of the facility (Lowney/Kaldreer, 1972). These silts and clays, which are generally saturated and moderately to highly plastic, are interbedded with sand and peat layers.

Approximately 75 percent of the Hunter's Point land area is covered by man-made fill. This material generally consists of loose to firm gravel, sand, silt, clay, rock fragments, vegetable matter, and man-made debris in various combinations. Most of the fill was obtained from excavation of the bedrock ridge. The remaining fill was derived from industrial wastes (primarily sandblast waste) and includes both industrial and domestic waste landfills.

1.5 HYDROGEOLOGY

Review of existing boring logs indicates that ground water is generally present at relatively shallow depths (2 to 12 feet) throughout the lowlying areas of the facility. Although details of the local hydrogeology are not well known, it is believed that the site ground water probably flows radially outward toward the bay from inland areas of higher elevation Harding Lawson Associates (1988) note that local ground water flow directions may be complex because of local variations in topography and hydraulic properties of the subsurface materials.

TABLE 1-1
UNDERGROUND TANKS AT
HUNTERS POINT ANNEX

TANK NO.	LOCATION	GALLONS	CONTENTS	TYPE
S-001	Bldg. 253	3,000	Gasoline	Steel
S-002	Bldg. 253	3,000	Gasoline	Steel
S-003	Bldg. 253	3,000	Gasoline	Steel
S-004	Bldg. 253	3,000	Gasoline	Steel
S-135	Bldg. 116	1,250	Fuel Oil	Steel
S-136	Bldg. 118	750	Fuel Oil	Steel
S-209	Bldg. 203	210,000	Fuel Oil	Concrete
S-211	Bldg. 203	3,000	Fuel Oil	Steel
S-212	Bldg. 203	4,500	Fuel Oil	Steel
S-213	Bldg. 203	35,000	Treated Water	Concrete
S-214	Bldg. 205	21,924	Fuel Oil	Steel
S-215	Bldg. 270	25,320	Paint Thinner	Steel
S-251(1)	Bldg. 251	Unknown	Unknown	Unknown
S-251(2)	Bldg. 251	Unknown	Unknown	Unknown
S-304	Bldg. 304	6,880	Gasoline	Steel
S-305	Bldg. 304	6,880	Gasoline	Steel
S-435(1)	Bldg. 435	Unknown	Unknown	Unknown
S-435(2)	Bldg. 435	Unknown	Unknown	Unknown
S-508(?)	Bldg. 500	750	Fuel Oil	Steel
S-711	Bldg. 709	5,000	Gasoline	Steel
S-712	Bldg. 709	5,000	Gasoline	Steel
S-713	Bldg. 709	5,000	Gasoline	Steel
S-714	Bldg. 709	5,000	Diesel	Steel
S-801	Bldg. 811	10,800	Diesel	Steel
S-802	Bldg. 811	6,880	Fresh Water/ Diesel	Steel
S-812	Bldg. 813	10,000	Fuel Oil	Steel

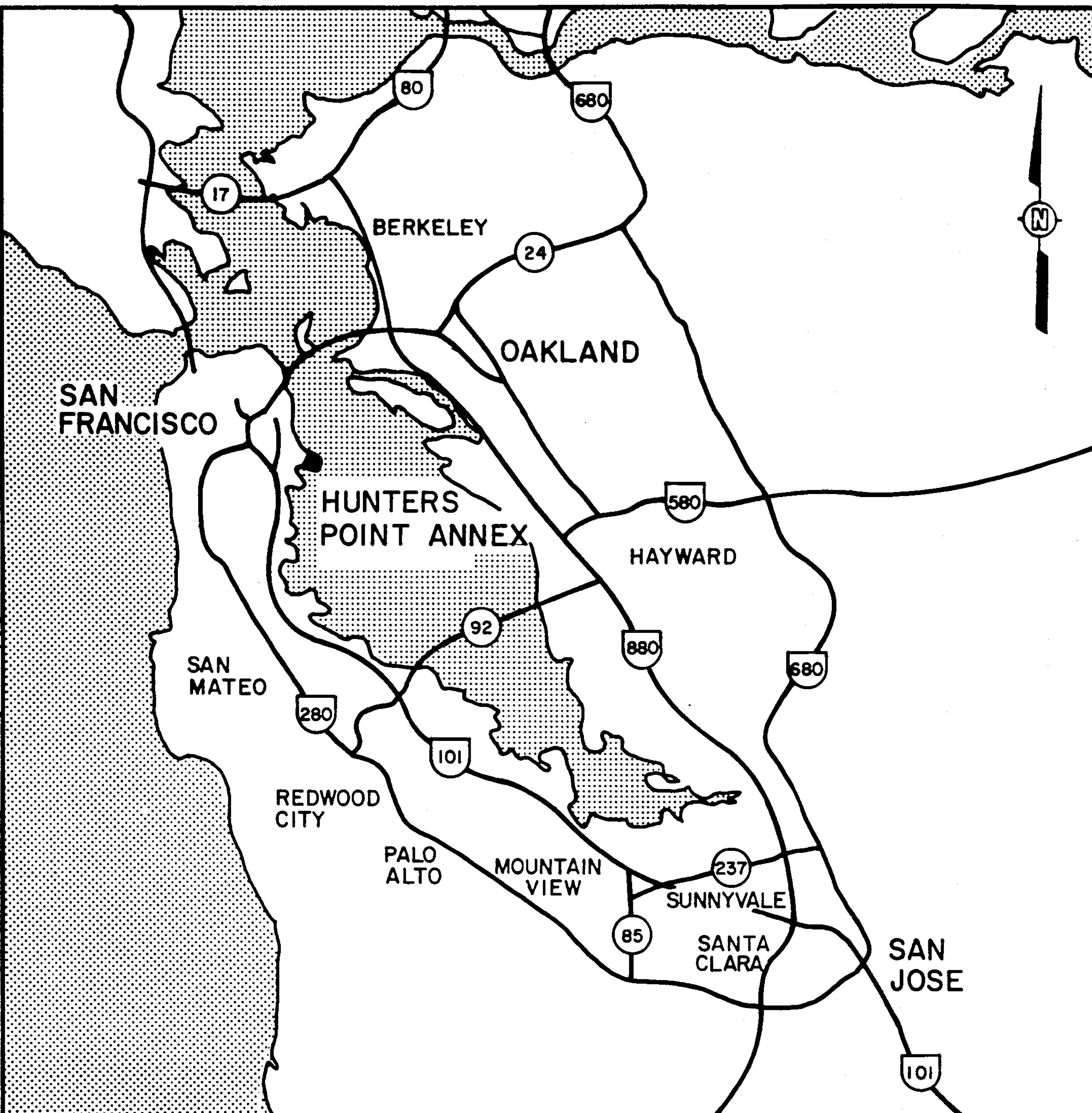

FIGURE 1-1

SITE LOCATION MAP

PREPARED FOR

NAVAL STATION TREASURE ISLAND,
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

IT ...Creating a Safer Tomorrow

"Do Not Scale This Drawing"

DRAWING NUMBER 4...617-A1

CHECKED BY SAW 4-28-89
APPROVED BY SAW 4-28-89
DRAWN BY SJZ 3-7-88

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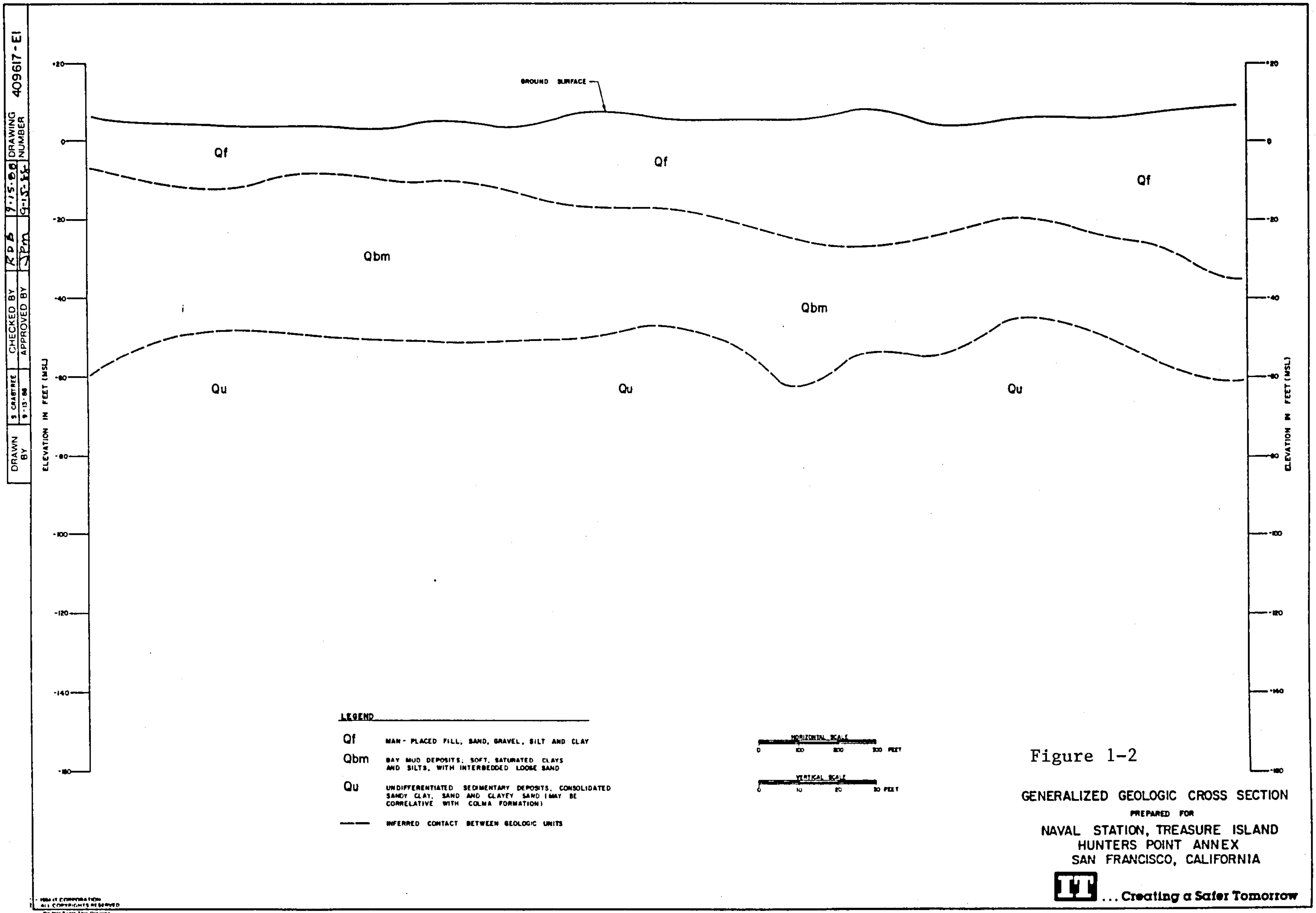

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S CRABTREE
9-13-88
CHECKED BY
KDB
9-15-88
APPROVED BY
JPM
9-15-88
DRAWING NUMBER
409617-E1
ELEVATION IN FEET (MSL)
+20
0
-20
-40
-60
-80
-100
-120
-140
-160
GROUND SURFACE
Qf
Qbm
Qu
LEGEND
Qf MAN-PLACED FILL, SAND, GRAVEL, SILT AND CLAY
Qbm BAY MUD DEPOSITS; SOFT, SATURATED CLAYS AND SILTS, WITH INTERBEDDED LOOSE SAND
Qu UNDIFFERENTIATED SEDIMENTARY DEPOSITS, CONSOLIDATED SANDY CLAY, SAND AND CLAYEY SAND (MAY BE CORRELATIVE WITH COLMA FORMATION)
INFERRED CONTACT BETWEEN GEOLOGIC UNITS
HORIZONTAL SCALE
0 100 200 300 FEET
VERTICAL SCALE
0 10 20 30 FEET
GENERALIZED GEOLOGIC CROSS SECTION
PREPARED FOR
NAVAL STATION, TREASURE ISLAND
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA
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Figure 1-2

2.0 SAMPLING PROGRAM

2.1 GENERAL ELEMENTS OF THE SAMPLING PROGRAM

The objectives of this sampling program are as follows:

- Identification of Tanks and Tank Contents
- Determination of Leaking Tanks
- Characterization of Leaking Tanks

All tank contents will be sampled for laboratory analysis in order to establish or confirm tank content type. All tanks and the associated piping in their immediate vicinity will be accurately located, and their dimensions determined (Table 1-1). Steps taken to locate the tanks will include review of available maps and drawings, interviews with site personnel, and geophysical (magnetic and ground-penetrating radar) surveys.

Soil gas surveys and subsurface soil sampling will be used to determine if any of the identified tanks and associated piping are leaking. The soil gas surveys will be performed for all tanks containing volatile compounds. For tanks containing non-volatile compounds, shallow soil borings will be drilled to sample soils at depths around the tanks.

Any tanks found to be leaking will be further investigated to characterize the nature and extent of soil and ground water contamination. Additional soil gas surveys and soil sampling will be performed. Soil borings used to obtain soil samples will be converted to monitoring wells. Ground water samples will be collected for laboratory analysis.

All field sampling, and laboratory testing methods and procedures will be in conformance with applicable federal, state, and local regulations. Health and safety requirements as defined in Section 5.0 and Volume IV, Health and Safety Plan, shall be observed during the sampling program.

2.2 IDENTIFICATION OF TANKS AND TANK CONTENTS

2.2.1 Geophysical Surveys

Prior to field sampling, and after review of available data, a geophysical survey will be performed to locate each tank and its associated piping. The geophysical survey will include techniques such as as magnetic and ground-penetrating radar. On-site conditions will dictate the specific type of geophysical technique to be used. The results obtained from the geophysical survey will reduce the potential for damaging underground objects during drilling. It will also help to delineate the exact areas to be excavated during the removal of the tanks.

2.2.2 Tank Content Sampling

Each tank will be sampled for free or floating product. A sample will be collected which is indicative of the thickness of the floating product in the tank. This will be accomplished by the use of a clear, acrylic bailer which is designed for collection of a liquid sample at the free product/water interface. Once a determination is made as to the amount of free product present in a tank, a representative sample of the tank contents will be taken. Details of the sampling procedures and equipment are presented in Section 4.1 of this work plan. The liquid contents of all tanks will be sampled for laboratory analysis. Samples from similar tanks in a tank group will be composited if the liquid contents of these tanks are also similar. Assuming all 26 tanks contain liquid, a total of 20 samples (including three composited samples from nine tanks) will be sent to the laboratory for characterization analysis (Section 3.2).

2.3 DETERMINATION OF LEAKING TANKS

2.3.1 Soil Gas Surveys

Soil gas sampling will be used initially in the field to determine quickly whether the underground tanks have leaked. This method is dependent on the porosity of the soil. In wet or tight soils gas cannot be drawn through the soil and no determination can be made. However, the soil gas probes will target the backfill of the tanks; the backfill of underground is traditionally sand.

Soil gas testing will be conducted for all tanks or tank groups containing volatile compounds (gasoline, paint thinner) and their associated piping (Table 1-1). This procedure will not be used for tanks containing non-volatile compounds (i.e., fuel oil and diesel).

A PHOTOVAC TIP I (TIP) instrument will be used for the survey. The number of sampling points surveyed will vary from four points for each isolated tank to ten points for a group of four tanks. Sampling point locations will be at the four corners of cylindrical tanks and at four equally spaced locations around circular tanks. Actual sampling point locations for a given tank or tank group may be influenced by constraints imposed by adjacent structures and utilities. Prior to soil gas sampling at a given location, a utility survey will be conducted over the area of interest to locate buried electrical, fuel, and water lines. The soil gas survey methodology is discussed in Section 4.2 of this document.

2.3.2 Soil Sampling

Subsurface soil samples will be collected around those tanks containing non-volatile compounds (Table 1-1). These samples will be taken from shallow borings drilled at locations near those tanks. No soil samples will be taken in the saturated zone. Two borings will be drilled near each tank or tank group. Most of these tanks are known or assumed to be isolated tanks, with only one known two-tank tank group. Consequently, approximately 30 borings are planned. Exact boring locations will be determined on the basis of proximity of adjacent structures, buried utilities, and the ground water hydraulic gradient in the area, if known. The boring(s) will be drilled to a depth of about 20 feet corresponding to an estimated 5 feet below the bottom of each tank. Soil samples will be collected at five-foot intervals in each boring for a total of three samples per boring. At least one test boring will be installed to about 30 feet below the level of the deepest tank bottom to provide representative data of subsurface conditions.

Soil samples will be collected, inspected, packaged, and shipped to IT laboratories for chemical analysis. Chain of Custody and Requests for Analysis will be completed in accordance with the Quality Assurance/Quality Control Plan Volume III. The chemical analyses planned are described in Section 3.3 of this work plan. A detailed geologic log will be prepared for each boring. Details of the drilling method are presented in Section 4.3. Details of the soil sampling collection and handling procedures are presented in Section 4.6.

2.4 CHARACTERIZATION OF EXTENT OF CONTAMINATION

2.4.1 Soil Gas Surveys

A series of supplemental soil gas sampling points will be placed around those tanks and tank groups determined to be leaking volatile organic compounds. The purpose of these additional sampling points is to estimate the gross extent of the contamination plume resulting from the tank leaks. The number and placement of the supplemental sampling points will be determined when the results of the initial soil gas sampling program are available. Soil gas survey procedures are described in Section 4.2 of this work plan.

2.4.2 Soil Sampling

Additional soil borings will be drilled around tanks found to be leaking to further characterize the contaminant plume and to confirm and complete the analytical data from the initial soil gas survey. Each boring will be logged and soil samples will be recovered on 5-foot intervals to a depth of 5 feet below the bottom of the adjacent tanks and shipped to IT Cerritos laboratory for chemical analysis. The location and actual depth of the additional boring will depend on the results of the soil gas survey and initial soil sampling. The analyses planned are described in Section 3.3 of this work plan.

The additional soil sampling and testing data will be used to further define the contamination plume both horizontally and vertically. Soil borings will be drilled around tanks leaking volatile compounds as well as tanks leaking non-volatile compounds. The borings will extend to depths below the ground water table to allow for sampling of ground water as well as soil.

A detailed geologic log will be prepared for each soil boring. Drilling procedures are discussed in Section 4.3 of this work plan. Details of the soil sample collection and handling procedures are presented in Section 4.6.

2.4.3 Monitoring Well Installation

To provide for ground water sampling, the additional soil borings discussed in Section 2.4.2 along with specifically designated borings may be converted to monitoring wells. The location of monitoring wells will be selected on the basis of the results of the soil gas survey and previous subsurface analyses. The location and depth of the borings will also satisfy the RWQCB guidelines relating proximity to the source of leaks and the gradient of the water table.

Ground water from each monitoring well will be sampled only once as part of this investigation. However, the monitoring wells will be constructed according to standard procedures (Section 4.4) and will be left in place to allow for continued sampling should the Navy elect to do this.

Due to the probable saline condition of the ground water, the wells will be constructed of 4-inch-diameter Schedule 40 PVC casing. In accordance with Guidelines for Addresing Fuel Leaks established by the Regional Water Quality Control Board (RWQCB), San Francisco Bay Region, the monitoring well borings will be drilled to a depth of 20 feet into the uppermost aquifer or 5 feet into the underlying aquitard if the uppermost aquifer is less than 20 feet thick. However, based on IT's knowledge of the Subsurface Bay Mud, an organic clay is expected within 15 feet of the ground surface. Therefore, the wells will extend only about five feet into the clay.

The monitoring wells will be screened in the uppermost aquifer such that the screen extends approximately 2.5 feet above and below the highest and lowest ground water table elevations, respectively. Details of monitoring well construction methods are presented in Section 4.4 of this work plan.

2.4.4. Ground Water Sampling

Ground water sampling for this investigation will be limited to one round of sampling that includes all newly installed monitoring wells. Each well will first be checked for floating free product. Sampling of floating free product will not commence until at least 24 hours after development of the well. If found, this material will be sampled and shipped to an IT laboratory for analysis. If floating free product is not present, or present in only minor amounts (layer less than 0.25-inch thick), the ground water will be sampled and shipped to the laboratory for analysis for dissolved constituents.

Sampling procedures are presented in Section 4.7 of this work plan.

TABLE 2-1
LIST OF EQUIPMENT AND USE

TYPE OF EQUIPMENT	USE
Magnetometer	Geophysical Survey of Tanks
Acrylic Bailer	Sampling of Tank Contents
Coliwasa	Sampling of Tank Contents
Hollow Stem Augers	Drilling of Soil Borings
Split Spoon Sampler	Obtaining Soil Samples from Drilling Process
PHOTOVAC TIP I	Soil Gas Survey

3.0 CHEMICAL ANALYSES TO BE PERFORMED

3.1 GENERAL DESCRIPTION

This section summarizes the chemical analyses to be performed on tank content, soil, and ground water samples during the underground tank investigation. The rationale for the locations and frequency of sampling and the required analyses has been included as part of the description of the sampling program (Section 2.0).

3.2 TANK CONTENTS

Samples of liquid tank contents will be sent to IT's Cerritos laboratory for analysis for full content characterization. Tank content samples will be analyzed according to analyses noted in Tables 3-1 and 3-2. The numbers of analyses shown in Table 3-1 are estimates, the final number will depend on actual tank content present.

3.3 SOIL SAMPLES

Soil samples collected as part of the leak detection and characterization tasks will be sent to IT's Cerritos laboratory for analysis.

One sample from each leak detection soil boring will be analyzed for high boiling point hydrocarbons (Table 3-1). The purpose of these analyses is to detect or confirm the presence of non-volatile product. Laboratory analyses will be performed according to tank content. Analytic methods are listed in Table 3-2; analytical detection limits in Tables 3-3 and 3-4; and sample containers, preservatives, and holding times in Table 3-5.

Soil samples from the leak characterization borings will be analyzed for low and high boiling point hydrocarbons, ethylene dibromide, organo-lead, and scanned for aromatic and halogenated hydrocarbons (Table 3-1). Results from these analyses, along with those for ground water samples, will be used to estimate the lateral and vertical extent of contamination at leaking tanks and tank groups.

3.4 GROUND WATER SAMPLES

Ground water samples will be collected as part of the tank leak characterization task and will be shipped to IT's Cerritos laboratory for analysis. Analyses to be performed on these samples are listed in Table 3-1. Analytical methods are listed in Table 3-2; analytical detection limits in Tables 3-3 and 3-4; and sample containers, preservatives and holding times in Table 3-5. The number of analyses shown in this table are best estimates at this time. The actual number of analyses will depend on the number of tanks found to be leaking, the product being leaked, the number of samples collected, and the quality control requirements. Results of these analyses will be used in the estimation of the lateral and vertical extent of the contamination plumes at the leaking tanks and/or tank groups.

3.5 LABORATORY ANALYTICAL PROCEDURES

3.5.1 Analytical Methods

A summary of the applicable analytical methods is presented in Table 3-2.

3.5.2 Analytical Detection Limits

The analytical detection limits for each of the methods are listed, by matrix, in Tables 3-3, and 3-4 in this document.

3.5.3 Sample Containers, Preservation and Holding Times

All sample containers will comply with the EPA Superfund Sample Container Repository Program. Sample containers, preservation and holding times are listed in Table 3-5. All samples will be iced in the field immediately upon collection by the use of double bagged ice cubes or "Blue Ice."

3.5.4 Laboratory Quality Assurance/Quality Control

The quality assurance (QA) objectives for this project are to provide information, data, and records that are technically sound, statistically valid, and properly documented. Actions which are routinely followed when analyzing samples include:

- Holding times and the amount of sample available are reviewed and the analyses prioritized.

- Analyses are to be performed within holding times according to accepted procedures.
- A calibration curve consisting of at least three standards and a reagent blank should be prepared as specified in the methodology.
- Preparation and analysis of at least one procedural blank should be completed for each group of samples analyzed using a specific procedure.
- At least one spiked sample should be analyzed for every 20 samples processed to monitor the percent recovery and accuracy of the analytical procedure.
- One matrix spike duplicate should be analyzed for every 20 samples.

Specific details on the laboratory quality assurance and quality control procedures are given in the Quality Assurance/Quality Control Plan, Volume III.

TABLE 3-1
LABORATORY ANALYSES TO BE PERFORMED

ANALYTE	TANK CONTENT SAMPLES	LEAK DETECTION SOIL SAMPLES	LEAK CHARACTERIZATION SOIL AND GROUND WATER SAMPLES[1]
Volatile hydrocarbons i.e., gasoline, plus benzene, toluene and xylene			
Soil samples	--	--	18
Liquid samples	20	--	6
Ethylene dibromide (EDB)			
Soil samples	--	--	18
Liquid samples	--	--	6
Organo-lead			
Soil samples	--	--	18
Liquid samples	--	--	6
Semi & non-volatile hydrocarbons i.e., diesel			
Soil samples	--	30	36
Liquid samples	20	--	12
Scan for aromatic and halogenated hydrocarbons			
Soil samples	--	--	9
Liquid samples	20	--	3

[1] These values do not include quality control samples.

TABLE 3-2
ANALYTICAL METHODS

METHOD NUMBER PARAMETER	WATER	SOIL
Total Petroleum Hydrocarbons - Volatiles/BTX & E	DHS METHOD[1]	DHS METHOD[1]
Total Petroleum Hydrocarbons - Semi & Non Volatiles	DHS METHOD[1]	DHS METHOD[1]
Tetraethyl lead (organo-lead)	DHS METHOD[1]	DHS METHOD[1]
Ethylene Dibromide (EDB)	EPA 601[2]	8010[3]
Volatile Organic Compounds (VOCs)		
pH	150.1[2]	--
Specific Conductance	120.1[2]	--

[1] Leaking Underground Fuel Tank (LUFT) Field Manual, December 1987. Appendix B

[2] "Methods for Chemical Analysis of Water Wastes," EPA-600/4-79-020, latest edition.

[3] "Test Methods for Evaluating Solid Waste," EPA, SW-846 2nd Revision.

TABLE 3-3
ANALYTICAL DETECTION LIMITS[a,b]

PARAMETER	METHOD NO.	LOW[e] WATER[c] (mg/L)	METHOD NO.	LOW[e] SOIL/SEDIMENT[d] (mg/kg)
Total Petroleum Hydrocarbons Volatiles	DHS METHOD[1]	0.5	DHS METHOD[1]	10.0
Total Petroleum Hydrocarbons Semi & Non Volatiles	DHS METHOD[1]	0.5	DHS METHOD[1]	10.0
Tetraethyl lead (organo-lead)	DHS METHOD[1]	0.02	DHS METHOD[1]	2.0
Ethylene dibromide	EPA 601[2]	0.0005	EPA 8010[3]	.005
pH	150.1[2]	0.1 SU	--	--
Specific Conductance	120.1[2]	1 umh os/cm	--	--

[a] Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable.

[b] Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the contract, will be higher.

[c] Medium Water Contract Required Detection Limits (CRDL) for Volatile TCL Compounds are 100 times the individual Low Water CRDL.

[d] Medium Soil/Sediment Contract Required Detection Limits (CRDL) for Volatile TCL Compounds are 100 times the individual Low Soil/Sediment CRDL.

[e] CLP Definition, <10 ppm of target compound.

[1] LUFT Leaking Underground Fuel Tank (LUFT) Field Manual, December, 1987. Appendix B.

[2] "Methods for Chemical Analysis of Water Wastes," EPA-600/4-79-020, latest edition.

[3] "Test Methods for Evaluating Solid Waste," EPA, SW-846-2nd Edition.

TABLE 3-4
ANALYTCIAL DETECTION LIMITS
VOLATILE ORGANIC COMPOUNDS

PARAMETER	CAS NUMBER	METHOD	DETECTION LIMITS[a,b] LOW[e] WATER[c] ug/L	LOW[e] SOIL/SEDIMENT[d] ug/Kg
Chloromethane	74-87-3	8240	10	10
Bromomethane	74-83-9	8240	10	10
Vinyl chloride	75-01-4	8240	10	10
Chloroethane	75-00-3	8240	10	10
Methylene chloride	75-09-2	8240	5	5
Acetone	67-64-1	8240	10	10
Carbon disulfide	75-15-0	8240	5	5
1,1-Dichloroethene	75-35-4	8240	5	5
1,1-Dichloroethane	75-35-3	8240	5	5
trans-1,2-Dichloroethene	156-60-5	8240	5	5
Chloroform	67-66-3	8240	5	5
1,2-Dichloroethane	107-06-2	8240	5	5
2-Butanone	78-93-3	8240	10	10
1,1,1-Trichloroethane	71-55-6	8240	5	5
Carbon tetrachloride	56-23-5	8240	5	5
Vinyl acetate	108-05-4	8240	10	10
Bromodichloromethane	75-27-4	8240	5	5
1,1,2,2-Tetrachloroethane	79-34-5	8240	5	5
1,2-Dichloropropane	78-87-5	8240	5	5
trans-1,3-Dichloropropene	10061-02-6	8240	5	5
Trichloroethene	79-01-6	8240	5	5
Dibromochloromethane	124-48-1	8240	5	5
1,1,2-Trichloroethane	79-00-5	8240	5	5
Benzene	71-43-2	8240	5	5
cis-1,3-Dichloropropene	10061-01-5	8240	5	5
Bromoform	75-25-2	8240	5	5
2-Hexanone	591-78-6	8240	10	10
4-Methyl-2-pentanone	108-10-1	8240	10	10
Tetrachloroethene	127-18-4	8240	5	5

TABLE 3-4
ANALYTICAL DETECTION LIMITS
VOLATILE ORGANIC COMPOUNDS
(continued)
PAGE 2 OF 2

PARAMETER	CAS NUMBER	METHOD	DETECTION LIMITS[a,b] LOW[e] WATER[c] ug/L	LOW[e] SOIL/SEDIMENT[d] ug/Kg
Toluene	108-88-3	8240	5	5
Chlorobenzene	108-90-7	8240	5	5
Ethyl benzene	100-41-4	8240	5	5
Styrene	100-42-5	8240	5	5
Total xylenes		8240	5	5

[a]Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable. CLP Scope of Work 785.

[b]Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the contract, will be higher.

[c]Medium Water Contract Required Detection Limits (CRDL) for Volatile TCL Compounds are 100 times the individual Low Water CRDL.

[d]Medium Soil/Sediment Contract Required Detection Limits (CRDL) for Volatile TCL Compounds are 100 times the individual Low Soil/Sediment CRDL.

[e]CLP Definition, < 10 ppm of target compound.

Reference: EPA Contract Laboratory Program (CLP)
Contract Required Detection Limits (CRDL)

TABLE 3-5
SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

ANALYSIS	SAMPLE TYPE	CONTAINER	PRESERVATIVE	HOLDING TIME
Volatile Organic Compounds	Water	2-40 mL amber glass vials Teflon-backed septum No head space	Cool to 4°C add 2 drops 1:1 HCl	14 days
	Soil	Brass sleeve or 250 mL glass jar	Cool to 4°C	14 days
Total Petroleum Hydrocarbons - Volatiles	Water	2-40 mL vials Teflon-backed septum No head space	Cool to 4°C add 2 drops 1:1 HCl	14 days
	Soil	1 sleeve, brass	Cool to 4°C	14 days
Total Petroleum Analysis Hydrocarbons Semi & Non Volatile analysis	Water	2-40 mL vials Teflon-backed septum No head space	Cool to 4°C add 2 drops 1:1 HCl	14 days to extract; within 40 days
	Soil	1 sleeve, brass	Cool to 4°C	14 days to extract; within 40 days
Tetraethyl lead	Water	1 L poly	Cool to 4°C	14 days
	Soil	1 sleeve, lexan	Cool to 4°C	14 days
Ethylene dibromide	Water	2-40 mL vials Teflon-backed septum No head space	Cool to 4°C add 2 drops 1:1 HCl	14 days
	Soil	brass sleeve	Cool to 4°C	14 days
Volatile Organic Compounds	Water	2-40 mL vials Teflon-backed septum No head space	Cool to 4°C add 2 drops 1:1 HCl	14 days
	Soil	brass sleeve	Cool to 4°C	14 days

4.0 FIELD METHODS AND PROCEDURES

4.1 IDENTIFICATION OF TANKS AND TANK CONTENTS

4.1.1 Geophysical Surveys

Prior to field sampling, a geophysical survey will be performed to locate each tank and its associated piping. Anticipated on-site conditions include artificial fill over Bay Mud and sand backfill for the tanks. These conditions are more conducive to magnetometer geophysical surveys. The results obtained from the geophysical survey will reduce the potential for damaging underground objects during drilling. It will also help to delineate the exact areas to be excavated during the removal of the tanks.

4.2 TANK CONTENT SAMPLE COLLECTION

4.2.1 Sample Collection Procedure

Tanks found to contain free liquid will be sampled using a COLIWASA type sampler. Samples from tank groups that were in similar service will be composited for analysis. A duplicate sample from each tank will be collected and stored until the analysis results are completed, reviewed, and approved. Sample odor, clarity, and any stratifications will be noted and recorded on the sample collection log sheet (Figure 4-1).

4.2.2 Sample Containers and Preservation

Clean sample containers will be purchased in accordance with EPA Superfund Sample Container Repository protocols. Each container, in addition to the shipping container will be sealed with a tamper resistant custody seal. All samples will be handled according to proper Chain of Custody procedures. Sample containers and preservation techniques are listed in Table 3-5. Samples will be transported, under custody, to the laboratory within 24 hours.

4.2.3 Sample Identification

Sample labels must contain sufficient information to uniquely identify the sample in the absence of other documentation. Labels will include as minimum:

- Project name and number
- Unique sample numbers
- Sample location

- Sampling date and time
- Signature of individual collecting the sample
- Preservation method employed
- Analytical method
- Sample type

The sample label will be directly affixed to the sample container and will be completed using indelible ink. An example of the sample labels to be used for this project is shown in Figure 4-2.

4.2.4 Decontamination Procedures

All sampling equipment will be cleaned prior to sampling and between each sample location. The procedure for decontamination will be as follows:

- Steam clean with direct spray from a steam cleaner
- Brush scrub with low alkaline, non-phosphate detergent solution
- Rinse with deionized water
- Double rinse with ASTM Type 2/HPLC water.

4.3 SOIL GAS SURVEYS

Soil gas surveys will be conducted initially as part of the effort to determine if tanks are leaking volatile compounds. Additional soil gas surveys will be performed around tanks found to be leaking volatile compounds to assist in estimating the extent of leakage around those tanks.

4.3.1 Description

Soil gas sampling is a relatively rapid, cost-effective technique to detect the presence of, and assist in the delineation of the extent of, shallow ground water contamination. The method is capable of detecting the presence of volatile chlorinated and petroleum hydrocarbons in the shallow subsurface. Due to their high volatility and vapor pressures, these compounds diffuse into the vadose zone above contaminated ground water. A Photovac SB-30 column will be used in the gas chromatograph. This column will allow for the detection and identification of volatile compounds.

Initially, attempts will be made to collect soil gas samples adjacent to underground storage tanks that are known to contain volatile compounds. The soil gas samples will be collected from depths of approximately 5 to 10 feet.

The following sampling protocol will be initiated at each site:

- As a screening step, soil gas sampling will be conducted near each tank identified as containing volatiles through tank content analyses.
- At tanks found to be leaking, additional soil gas sampling will be undertaken as necessary to refine the estimation of the distribution of chemicals in the vadose zone.
- Tank service lines found in the immediate vicinity of the tanks will be included in soil gas and the subsurface studies. No service lines in excess of 20 feet have been reported onsite.

4.3.2 Methodology

Sampling of volatile organic compounds (VOC) will be accomplished by driving a 3/8-inch diameter steel rod into the ground to depths of about 5 to 10 feet. Maximum penetration depth will be about 15 feet. Samples for soil gas must be taken above groundwater level as gas cannot be sampled under saturated conditions. The ground water conditions will be predetermined by the initial literature and data review, or from a test hole if the former does not provide adequate information. Once the steel rod is removed, a sampling probe (a perforated, 1/4-inch stainless-steel tube) is inserted into the resulting hole. The annular space between the probe and the ground perforation is sealed. A Teflon tube will connect the top of the buried probe to a mechanical vacuum pump which will be used to withdraw the soil gas.

A Photovac TIP I (TIP), photoionization detector/pump, is connected to the pump discharge for duration of the sampling. The TIP is a hand operated sampling wand used to screen soil gas samples. The TIP is used to determine when the sampling tube has been purged and to provide relative concentration values and dilution factors when subsequent analysis by gas chromatography is selected.

4.3.3 Compound Detection

Two main contaminant groups have been observed at the Hunters Point site:

- Gasoline. The benzene, toluene, and xylene (BTX) components will be reported. In areas where these compounds are present, the total photoionizable compound reading from the TIP will be used to estimate concentrations of gasoline expressed in terms of relative standards. This approach is selected since the ratio of BTX to gasoline varies with weathering (age) of the product.

- Semi-to-nonvolatile petroleum hydrocarbons. This group includes JP-5, kerosene, diesel fuel, and fuel oils. Because the volatile photoionizable components are minimal and vary with weathering, volatile hydrocarbon procedures are not reliable. Therefore, TIP readings cannot be used to estimate concentrations of these compounds.

4.3.4 Soil Gas Survey Sampling Techniques

The following Photovac TIP QA/QC procedures will be followed according to the TIP Standard Operating Procedures in Appendix A:

- TIP readings will be recorded at each sampling point together with the corresponding detection limits.
- One TIP duplicate sample measurement is required for each 10 sample analyses, with a minimum of one duplicate analysis per day. One TIP blank sample measurement is required for each 10 sample analyses, with a minimum of one blank sample analysis per day.
- TIP calibration will be checked and recorded three times daily using appropriate gas standards specified in Appendix A.

After each reading the TIP will be thoroughly aerated until its decontamination is complete, as defined by achieving either zero or ambient background levels. Small adjustments may be necessary to correct for zero drift.

QA/QC analysis will be a minimum 5 percent of the total number of analyses.

4.4 DRILLING METHOD

There are three purposes to drilling at HPA during this investigation. The primary purpose is to clearly and efficiently obtain subsurface soil samples from around underground storage tanks that may be leaking non-volatile compounds. The second purpose is to provide an opportunity for careful and detailed lithologic evaluation (logging) of soil collected as drive samples or cuttings in order to establish the subsurface stratigraphy at the sampling point. The third purpose for drilling is to provide boreholes for installation of monitoring wells to be used for ground water sampling.

Prior to well drilling or other subsurface probing, a detailed search will be made of accurate plans of all known underground utilities, including fuel, electrical, sewer and water lines, and any other buried feature that may impact the location of probe or drill holes. Magnetometer, electromagnetic (EM), and ground-penetrating radar (GPR) surveys will be completed over all areas of interest before probing or drilling to determine any unknown buried metallic objects.

All drilling, sampling, and well construction will adhere to California Regional Water Quality Control Board guidelines. Required permits will be obtained prior to drilling. A geologist, engineer, or field technician under the direct supervision of a California registered geologist, registered civil engineer, or certified engineering geologist will visually log each drill hole using cored samples and drill cuttings (Figure 4-3). Lithologic logs will be prepared using the Unified Soil Classification System.

Because of the relatively shallow soil sampling and monitoring well installation requirements for this investigation, the hollow-stem auger drilling technique will be used. Both sample extraction and monitoring well installation can be accomplished through the hollow stem which acts as a temporary casing. Details of monitoring well installation and soil sampling techniques are presented in Sections 4.4 and 4.6, respectively.

Soil borings not converted to monitoring wells will be backfilled with 95 percent cement grout and 5 percent bentonite to the ground surface.

4.5 CONSTRUCTION METHODS FOR WELL INSTALLATION

4.5.1 General Well Construction

All wells will be constructed of 4-inch nominal diameter PVC Schedule 40 casing and screen. The grade of the well pack will consist of Lonestar #C sand. Screen slot size will be 0.010-inch factory milled.

In accordance with applicable California State guidelines, the minimum annular space between well casing and boring walls will be two inches. PVC casings will be threaded at joints. Typical construction details for monitoring wells are shown on Figure 4-4.

Wells will be drilled to a minimum depth of 20 feet into the uppermost aquifer or five feet into the aquitard below the targeted aquifer, whichever is less. Where the aquitard beneath the targeted aquifer of interest is less than five feet thick, the hole will be tremmied (backfilled) with a bentonite pellet slurry or a neat cement grout up to a level that is within the aquitard.

The screened interval will be 5 feet in length, or multiples thereof, and will be placed adjacent to the aquifer material. In unconfined aquifers the top of the screen will be from approximately 2.5 feet above the water table. A square-threaded cap will be installed at the base of the screened section. Casing centralizers will be installed on the bottom of the the screened interval.

A clean, washed sand pack will be placed adjacent to the entire screened interval and will extend to 2 feet above the top of the screen. A 1- to 2-foot-thick bentonite pellet seal will be placed above the sand pack. The annulus above the bentonite seal will be filled with cement grout containing approximately 5 percent bentonite. Sand packs, and grout will be installed using a 2-inch tremie pipe.

A threaded, waterproof cap and a watertight locking steel casing cover will be placed on the well casing below grade. A well housing enclosure will be installed over the well and completed at grade to minimize hazard to continuing site operations.

4.5.2 Well Installation

Typical construction details for monitoring wells are shown on Figure 4-4. The well construction methods are as follows.

Monitoring wells will be drilled with a 12-inch continuous flight, hollow-stem auger. The casing and screen will be lowered through the hollow stem of the auger. The auger is withdrawn as filter pack, bentonite and cement are tremied in.

If the aquifer is at or near the ground surface, the screened interval will extend to within a minimum of 3 feet of the ground surface. The sand pack will extend 1 foot above the screened interval, followed by a 1-foot-thick bentonite pellet seal, in turn followed by a 1-foot-thick grout seal to the ground surface.

In the case of floating hydrocarbons on surface of the the water table, the well screen will be 2.5 feet above the highest anticipated seasonal water level.

4.5.3 Well Development Method

After well installation is completed and all cement seals have set for a minimum of 24 hours, the wells will be developed. Each well will be developed by swabbing and pumping. Swabbing will consist of rapid removal of water with a close fitting bailer. The bailer will be used also to remove debris accumulated in the well. After no more debris accumulates during swabbing, the well will be developed by pumping. For development by pumping, a pump will be lowered to screen level and pumped at increasing rates. Before pumping starts for the next higher rate, the pump is successively stopped and started about five times to create a surging effect. Development by pumping will continue until there is no further increase in specific capacity and pumped until water contains no settleable material. Well development equipment will be steam cleaned after use at each well. Data to be collected during well development should be recorded on the field activity daily log and will consist of:

- Depth to water and time of measurement
  - Before development
  - During development while pumping
  - After development at 1, 2 and 5 hours after pumping stops
  - Fast recovery will warrant more frequent measurement
- Equipment description, sizes, and settings
- Description of produced water, visual appearance and odor
- Amounts of water produced and times of production.

4.6 HANDLING OF CONTAMINATED MATERIALS

4.6.1 Materials Generated During Drilling

This section of the Sampling Plan describes the methods and procedures for collection, storage, and disposal of drilling cuttings and development water.

The immediate ground area around the auger hole will be covered with a heavy gauge plastic sheet to keep any contaminated drilling cuttings or development water from reaching the ground.

Soil brought to the surface from shallow auger borings, after sampling, will be shoveled into DOT 17-H drums and sealed for local transportation and disposal to an appropriate Class I disposal facility, if warranted by analytical results.

The protective plastic sheet will be used once for each drill site; the plastic will then be disposed of in the same manner as the solid wastes from drilling.

4.6.2 Extracted Water

Extracted water generated during well drilling, development, sampling and aquifer tests will be stored on site temporarily in steel drums. Periodically the water in these drums will be transferred to a holding tank for local transportation and disposal to an appropriate Class I disposal facility if analytical results warrants a hazardous waste classification. Samples of the water will be collected when the wells are sampled. The analytical data obtained from this sampling will be used to determine if the water is a hazardous waste.

4.6.3 Protective Clothing and Disposable Materials

During field operations disposable materials are generated, including protective clothing, respirator cartridge and plastic sheeting used to contain substances on site. These materials will be packed into DOT 17-H drums and handled in the same manner as drilling cuttings.

4.7 SOIL SAMPLE COLLECTION

This section describes soil sampling procedures appropriate for soil samples for chemical analyses at selected depths and locations. Identifying numbers for the soil samples and sample locations will be made in the field. The location number will contain a site identifier.

Soil samples for chemical analyses will be collected using a California Modified Drive sampler, which consists of a outer steel coring barrel into which three, 6-inch long x 2-inch diameter sample sleeves will be inserted. The sampling device will be driven into the ground using a 140-lb hammer dropped from a height of 30 inches.

4.7.1 Sample Collection Procedures

The procedure for obtaining soil samples using the California Modified Drive sampler and hollow stem auger is as follows:

- The hole will be drilled to the desired sample depth.
- Decontaminated sleeves will be inserted into the clean sampler. Brass sleeves will be used to contain the soil for the organic analyses; lexan sleeves will be used for metals analyses. The sampler will be reassembled with new sleeves after each use.
- The sampler will be attached to a driving mechanism and forced into the undisturbed soil at the bottom of the drill hole.
- The sampler will be removed from the drill hole and detached from the driving mechanism.
- The nose piece will be removed and the core barrel will be opened to reveal the sleeve samples.
- The sleeves will be removed one at a time. The ends of each sleeve will be immediately sealed with a Teflon-lined plastic cap. The uppermost sample sleeve will contain a small portion of residual soil penetrated previously and is not acceptable as a chemical analysis sample. This portion of the sample will be bagged, labeled, and saved for soil identification purposes.
- Each sleeve will be placed in a Ziploc® bag. The bag will be custody sealed and will be placed in an ice chest chilled to 4°C with blue ice or double-bagged ice cubes.
- The Chain of Custody (Figure 4-5) and Request for Analysis forms (Figure 4-6) will be completed in the field. The Request for Analysis form will state that the volatile sample portion be taken from the middle of the metal sample sleeve.

4.7.2 Sample Containers and Preservation

Clean sleeves will be used to collect and contain soil samples. All samples will be cooled to 4°C upon collection. This will be accomplished by placing samples in coolers with blue ice, preferably, or double-bagged ice cubes. (At least two 5 pound bags per cooler.)

4.7.3 Sample Identification

Each sleeve will be marked to distinguish between the top and bottom ends. Each sample will be labeled with the following information:

- Job name and number
- Sample location/depth
- Unique sample number
- Name of Sample Collector
- Sampling date/time
- Analytical method(s)
- Preservative(s)

4.7.4 Decontamination Procedures

All sampling equipment will be cleaned prior to sampling and between each sample location. The procedure for decontamination will be as follows:

- Sample Sleeves
  - Each sleeve will be steam cleaned both inside and out.
  - Each sleeve will be completely scrubbed with a brush using a low alkaline, nonphosphate detergent solution.
  - Each sleeve will be thoroughly rinsed with deionized water.
  - The inside of each sleeve (the only sample contact surface) will be rinsed with a solvent appropriate for the requested analysis (Table 4-1).
  - The inside of each sleeve will be rinsed with deionized water.
  - A final ASTM Type 2/HPLC water rinse will be applied to each sleeve.
  - The sleeves will be air-dried.
  - Each sleeve will be stored in an individual polyethylene plastic bag to minimize atmospheric contamination.

- Core Barrel and Nose Piece
  - The inside surface of the core barrel and nose piece will be scrubbed with a brush using a low alkaline, nonphosphate detergent solution.
  - The equipment will be thoroughly rinsed with deionized water and air-dried.
  - The nose piece will have a final rinse using ASTM Type 2/HPLC water.

4.8 GROUND WATER SAMPLE COLLECTION

The following ground water sampling and analysis procedures have been developed in accordance with 40 CFR 265.92, Ground Water Monitoring, Sampling and Analysis, and 23 CAC, Chapter 3, Subchapter 15, Article 5.

Any necessary deviations from specified procedures will be recorded on the Ground Water Sampling Information Form (Figure 4-7) and in the field activity daily log or in the project field book.

4.8.1 Well Measurements

Water level measurements will be made to determine ground water table elevations or potentiometric head level, and to calculate well static water volumes.

The procedure for obtaining water level measurements is as follows: the electric water-level indicator probe will be lowered down the well until the audible signal "beeps," indicating contact of the probe with the water surface.

The water level will be recorded to the nearest 0.01 foot in the following manner:

- The water level indicator cable will be used to obtain the water level reading to the nearest 0.1 foot.
- A calibrated steel tape with 0.01-foot increments will be used by matching 0.1-foot intervals on the indicator cable to obtain the reading to the nearest 0.01 foot.

- This reading will be taken at a point on the well casing permanently marked and referenced to a specific datum point. This depth will be converted to mean sea level (MSL) from the surveyed reference elevation.

Water level measurements shall be recorded to the nearest 0.01 foot. The probe will be removed, and all parts in contact with the well water will be rinsed with a low alkaline, nonphosphate detergent solution and will be triple rinsed with deionized water.

4.8.2 Well Evacuation

Before a well is sampled, it should be evacuated to ensure that the water entering the well is representative of the formation water. Each well shall be purged until the total quantity of water removed is equal to or greater than five times the submerged volume of the casing or until the measured discharge exceeds the calculated volume of water contained in the screen, riser and sand pack. The discharge rate will be adjusted to keep the sand pack saturated during purging. If the recovery rate is unmanageably slow the well will be sampled as soon as a sufficient recharge volume becomes available. Purging will continue until the pH, temperature, and specific conductance of the well water has stabilized. If these parameters do not stabilize, a maximum of 10 times the submerged volume of the casing will be evacuated. The quantity and visual appearance of water recovered during evacuation will be recorded on the Ground Water Sampling Information Form (Figure 4-7).

One evacuation volume is calculated by using the following formula:

$$EV = (A-B) \times d^2 \times .0408$$

where EV = Evacuation volume, in gallons

A = Well depth in feet

B = Static water level depth in feet

d = Casing diameter in inches

.0408 = Constant including unit PI (3.14) and conversions from cubic feet to gallons and square inches to square feet, and dividing by 4 to correct for use of diameter in place of radius.

(Note: A and B measurements are taken from top of casing.)

Evacuation water will be collected in drums located at each well. The content of each drum will be periodically removed and disposed of in accordance with Section 4.5.2.

However, we anticipate site conditions to be saturated Bay Mud overlying any aquifer which may be present. Therefore, we expect all wells to be completed in Bay Mud. Well evacuation in Bay Mud will consist of the purging of the well until it is dry. The well will then be sampled when it has recharged to 80 percent of its initial water level.

4.8.3 Samples for Field Measurements

Temperature, pH, and specific conductance measurements will be obtained on samples extracted by bailer from the well.

Sampling personnel will note the color, visual observation of turbidity or sediment, and additional comments concerning the sample on the Ground Water Sampling Information Form.

4.8.4 Equipment Calibration

The water level indicator cable is calibrated annually against a surveyor's reference tape. Any required adjustments will be noted for field use.

Conductivity and pH meters will be calibrated daily in accordance with IT internal calibration procedures, or the manufacturers' specifications prior to use. All calibration data (readings, time, date, verification) shall be recorded in the daily field activity log and the IT Calibration Form.

4.8.5 Sample Collection Procedures

A dedicated PVC bailer will be lowered to the appropriate depth for sample collection. The bailer will be gently lowered and raised so that agitation of the sample is avoided.

All containers will be filled as completely as possible to eliminate headspace. Containers will not be overfilled to prevent preservation dilution.

4.8.6 Sample Containers and Preservation

All sample containers (bottles) used will comply with the requirements specified in the EPA Superfund Sample Container Repository Program.

All samples shall be cooled to 4°C by "icing" in the field, either by double bagging ice cubes or with "blue ice." Sample containers and preservation techniques are listed in Table 3-5 of this document.

4.8.7 Sample Identification

Samples shall be adequately marked for identification at the time of collection. Marking shall be on a label attached to the sample container. Sample identification shall include, as a minimum:

- Project name and number
- Unique Sample number
- Analytical method
- Sample location
- Name of sample collector
- Sampling date and time
- Preservative(s).

4.8.8 Decontamination Procedures

All equipment will be handled in a manner that will prevent cross contamination between wells and avoid the introduction of surface contamination into a well. Bailer ropes will be replaced with new decontaminated rope after each sampling.

Well measurement equipment with permanent line/cable will be cleaned as follows:

- Rinse with low alkaline, nonphosphate detergent solution
- Rinse with deionized water
- Double rinse with ASTM Type 2/HPLC water.

Immediately after cleaning and before use, equipment will be placed into a polyethylene wrap to minimize the chance of atmospheric contamination. After all sampling is completed, decontaminated equipment will be wrapped in polyethlene plastic sheet and stored.

4.9 FIELD QUALITY CONTROL SAMPLES

A field quality control (QC) sampling scheme will be established to check sampling and analytical accuracy and precision. All QC samples will be shipped according to the Chain of Custody procedures specified in Section 4.9. Field QC samples will include the following types of samples:

- Duplicates
- Blanks and background samples
  - Equipment blank
  - Field bottle blank
  - VOA travel blank
  - Background.

Field QC samples will have discrete sample numbers and be submitted as "blind" to the laboratories. These samples will be analyzed as if they were original field samples. Results of these samples will be included in the analytical report.

Results for QC samples will not be used to adjust the results obtained for original samples. If contaminants are found in the blanks, attempts will be made to identify the source of contamination and corrective action will be initiated.

4.9.1 Duplicates

A duplicate is a sample that is collected in parallel with its original sample for each analytical parameter. The procedure for obtaining the duplicate is identical to its original. The same container type, preservative, and sampling technique are used.

Duplicate soil samples will be obtained by collecting two sets of samples with the California Modified Sampler for a total of six sleeves. Two sleeves adjacent to one another within the core barrel will be considered duplicates of one another.

A minimum of one sample or 10 percent per parameter per matrix per site, whichever is greater, will be collected from locations suspected of being contaminated.

4.9.2 Blank Samples

Blank samples are used to determine cross contamination between sample collection and during shipment to the laboratory.

For liquids, the frequency of blank or background sample collection will be one sample per day per shipment per lab. The different types of blanks are listed below with the recommended number of each to be collected and analyzed.

4.9.2.1 Equipment Blank

After decontamination has been performed on sampling equipment and before the equipment is used, a reagent grade water rinsate is collected from the piece of equipment (e.g., water level sounder). For soil gas, blank samples will be taken from the decontaminated syringes. Analysis of this type sample determines decontamination effectiveness. One equipment blank will be collected at the beginning of each phase of work (i.e., soil borings, well installation).

4.9.2.2 Field Bottle Blank

A field bottle blank is HPLC/ASTM-Type 2-grade water; the blank is transferred from its original container to a sample container at the sample location. Theoretically, the transfer will expose the water to ambient contaminants that would be measured during lab analysis. The field blank will be analyzed for all parameters specified for the sample location. One field bottle blank will be collected each week.

4.9.2.3 VOA Travel Blank

These blanks consist of an HPLC/ASTM Type 2 grade water sample. This sample is carried into the field by samplers along with actual samples, shipped to the laboratory, and analyzed exactly like all other samples. All VOA vials will be packed in the same cooler as the VOA blank. One VOA Blank will be collected and analyzed with each shipment to the laboratory.

4.9.3 Background Sample

Background samples are normally analyzed for the complete analytical suite.

However, based on our knowledge of the Hunters Point site, there is no area which can be assumed to be suitable for obtaining background samples. Therefore, there is no plan to collect background samples.

4.10 SAMPLE PACKAGING, SHIPMENT AND FIELD CHAIN OF CUSTODY

All Chain of Custody and Request for Analysis forms will be completed in the field. When sample custody changes, the personnel regulating the exchange will sign, date, and note the time on the Chain of Custody form(s).

A copy of the Chain of Custody form and the Request for Analysis form will be retained before sample shipment and will be placed in the project file.

Samples will be packaged and shipped so that the integrity of each sample is protected. Each sample will be placed in an individual Ziploc® bag; the baggie will be custody sealed, placed in an ice chest, and covered with preferably blue ice or double-bagged ice. All required documentation will be sealed in a baggie and placed in its respective cooler. After securing the ice chest, custody seals that warn against tampering will be applied. Samples to the laboratory will be shipped by overnight delivery.

TABLE 4-1

SLEEVE CONTAINER TYPE AND DECONTAMINATION SOLVENT

ANALYTICAL PARAMETERS	SLEEVE TYPE	DECON. SOLVENT
Metals	Lexan	0.1N Nitric Acid-Metals Grade
Volatile/Organic Compounds	Brass	Pesticide Grade Hexane
TPH	Brass	Pesticide Grade Hexane
Ethyleadibromide	Brass	Pesticide Grade Hexane

INTERNATIONAL TECHNOLOGY CORPORATION

DATE						
TIME						
PAGE ____ OF ____						
PAGE						
PROJECT NO.						

FIGURE 4.1

SAMPLE COLLECTION LOG

PROJECT NAME ______________________________

SAMPLE NO. ______________________________

SAMPLE LOCATION ______________________________

SAMPLE TYPE ______________________________

COMPOSITE ____YES ____NO

COMPOSITE TYPE ______________________________

DEPTH OF SAMPLE ______________________________

WEATHER ______________________________

CONTAINERS USED	AMOUNT COLLECTED

COMMENTS:

PREPARED BY: ______________________________

FIGURE 4.2

SAMPLE LABEL

INTERNATIONAL
TECHNOLOGY
CORPORATION

F
H R

Project Name ______________________________

Project No. ______________________________

Sample No. ______________________________

Collection Date/Time ______________________________

Collector's Name ______________________________

Sample Location ______________________________

Sample Type/Depth/Description ______________________________

Analyze For ______________ Preservative ______________

Bottle ________ of ________ ______Filtered ______ Nonfiltered

23-8-85

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FIGURE 4.3

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER:	PROJECT NAME:	
BORING NUMBER:	COORDINATES:	DATE:
ELEVATION:	GWL: Depth Date/Time	DATE STARTED:
ENGINEER/GEOLOGIST:	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS:		PAGE OF

DEPTH ( )	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS

NOTES:

243A-3-86

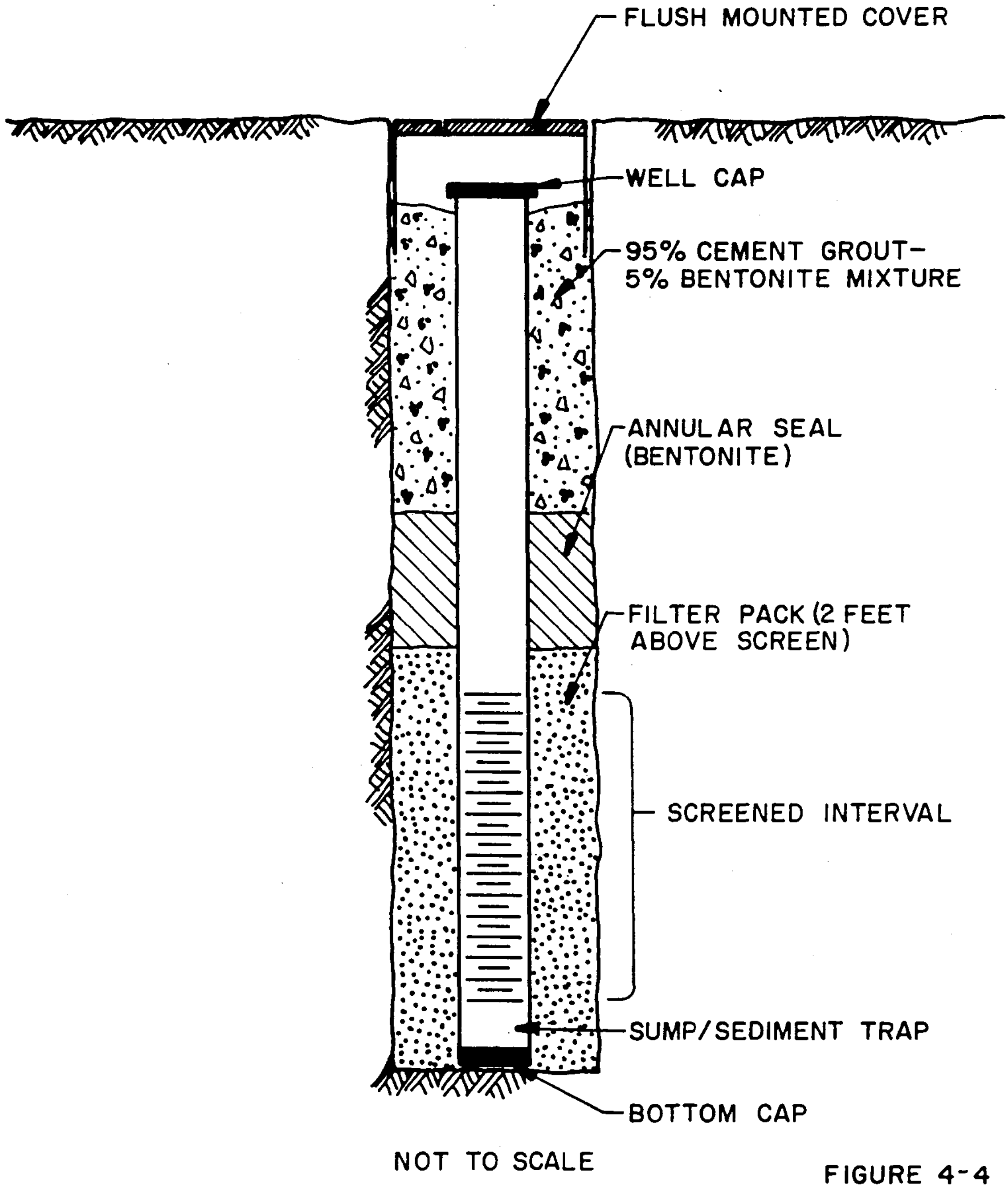

FIGURE 4-4

MONITORING WELL DESIGN

PREPARED FOR

NAVAL STATION TREASURE ISLAND,
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

DRAWING NUMBER 617-A2
CHECKED BY
APPROVED BY
TRS 3-2-88

IT ...Creating a Safer Tomorrow

INTERNATIONAL TECHNOLOGY CORPORATION

CHAIN-OF-CUSTODY RECORD

R/A Control No. ____________

C/C Control No. 001760

PROJECT NAME/NUMBER ____________ LAB DESTINATION ____________

SAMPLE TEAM MEMBERS ____________ CARRIER/WAYBILL NO. ____________

Sample Number	Sample *Location and Description*	Date and Time Collected	Sample Type	Container Type	Condition on Receipt (Name and Date)	Disposal Record No.

Special Instructions: ____________

Possible Sample Hazards: ____________

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By: ____________

   Received By: ____________

2. Relinquished By: ____________

   Received By: ____________

3. Relinquished By: ____________

   Received by: ____________

4. Relinquished By: ____________

   Received By: ____________

WHITE - To accompany samples

YELLOW - Field copy

FIGURE 4.5

N00217.000497
HUNTERS POINT
SSIC NO. 5090.3

FIGURE 4-6
REQUEST FOR ANALYSIS FORM
PAGE 4-23 A

PROJECT PLAN FOR
UNDERGROUND TANK INVESTIGATION

THE ABOVE IDENTIFIED FIGURE IS NOT AVAILABLE.

EXTENSIVE RESEARCH WAS PERFORMED BY NAVFAC SOUTHWEST TO LOCATE THIS FIGURE. THIS PAGE HAS BEEN INSERTED AS A PLACEHOLDER AND WILL BE REPLACED SHOULD THE MISSING ITEM BE LOCATED.

FOR ADDITIONAL INFORMATION,
PLEASE CONTACT:

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SAN DIEGO, CA 92132

TELEPHONE: (619) 532-3676
E-MAIL: diane.silva@navy.mil

Site ______________________ Sample No. ______________________
Well ______________________ Sampling Team ____________________
Job No. ______________________

Evaluation Volume Calculations

Water Height

SWH = MWD - MWLD ( ) = ( ) - ( )

Feet	Date	Time	By	
MWD = Measured Well Depth	____	____	____	____
MWLD = Measured Water Level Depth	____	____	____	____
SWH = Standing Water Height	____	____	____	____
SPL = Sand Pack Length	____	____	____	____

Volume

$WWV = SWH \times +0.163 \times CR^2 + SPV$ ( ) = ( ) x (0.163) x $(\quad)^2$ + SPV
SPV = 0.392 x SPL x (CR + 2) =
WWV = Well Water Volume in Gallons (including 2-inch sand pack)
SPV = Sand Pack Volume
CR = Casing Radius in Inches
WWV = ______________________

Purge Volume

Purge Volume 3 x WWV 3 x ( ) = ( )

Calculated by: ____________ Date: ______ Time: _______

Evacuation

Pump _________, # ________
Bailer _________, # ________

Start: Date: ________ Time: _______ By: _________

Complete: Date: ________ Time: _______ By: _________

Well Recovery see Page 3/3.

Purge	Vol, Gal	Date/Time Start	Date/Time Stop	By	Appearance Color	Odor[1] P/A
1						
2						
3						

[1] Odor - P = Present, A = Absent; if P, then describe

ENG:3237-T4-7/09148

FIGURE 4-7
(Continued)
GROUND WATER SAMPLING INFORMATION FORM

Sampling

SWH - Immediately Prior to Sampling
SWH = MWD - MWLD ( ) = ( ) - ( )
See above

	Feet	Date	Time	By
MWLD = Measured Water Level Depth Before Sampling	____	____	____	____

Start of Sampling: Date: ________ Time: ______ By: ________

Completion of Sampling: Date: ________ Time: ______ By: ________

Field Measurements

Measurement in well (Y/N) ____

Equipment	Number	Date	Calibrations Time	By
pH	____	____	____	____
Specific Conductance	____	____	____	____

Measurements[1]

	Temp, °C	pH,SU	Sp. Cond,umhos	Date	Time	By
1						
2						
3						
4						

COMMENTS:

[1] Measurement Sequence:

#1 - Immediately Prior to Sampling

FIGURE 4-7
(Continued)
GROUND WATER SAMPLING INFORMATION FORM
Page 3 of 3

Well Recovery

Start: Date: Time: Depth ____ Ft (From ____)

Depth (Ft)	
Time (Hrs)	
Depth (Ft)	
Time (Hrs)	
Depth (Ft)	
Time (Hrs)	

END: ____ ____ ____ ____ ____

#2,3 - During Sampling

#4 - Immediately After Sampling

ENG:3237-T4-7/09148

5.0 SITE SAFETY PLAN

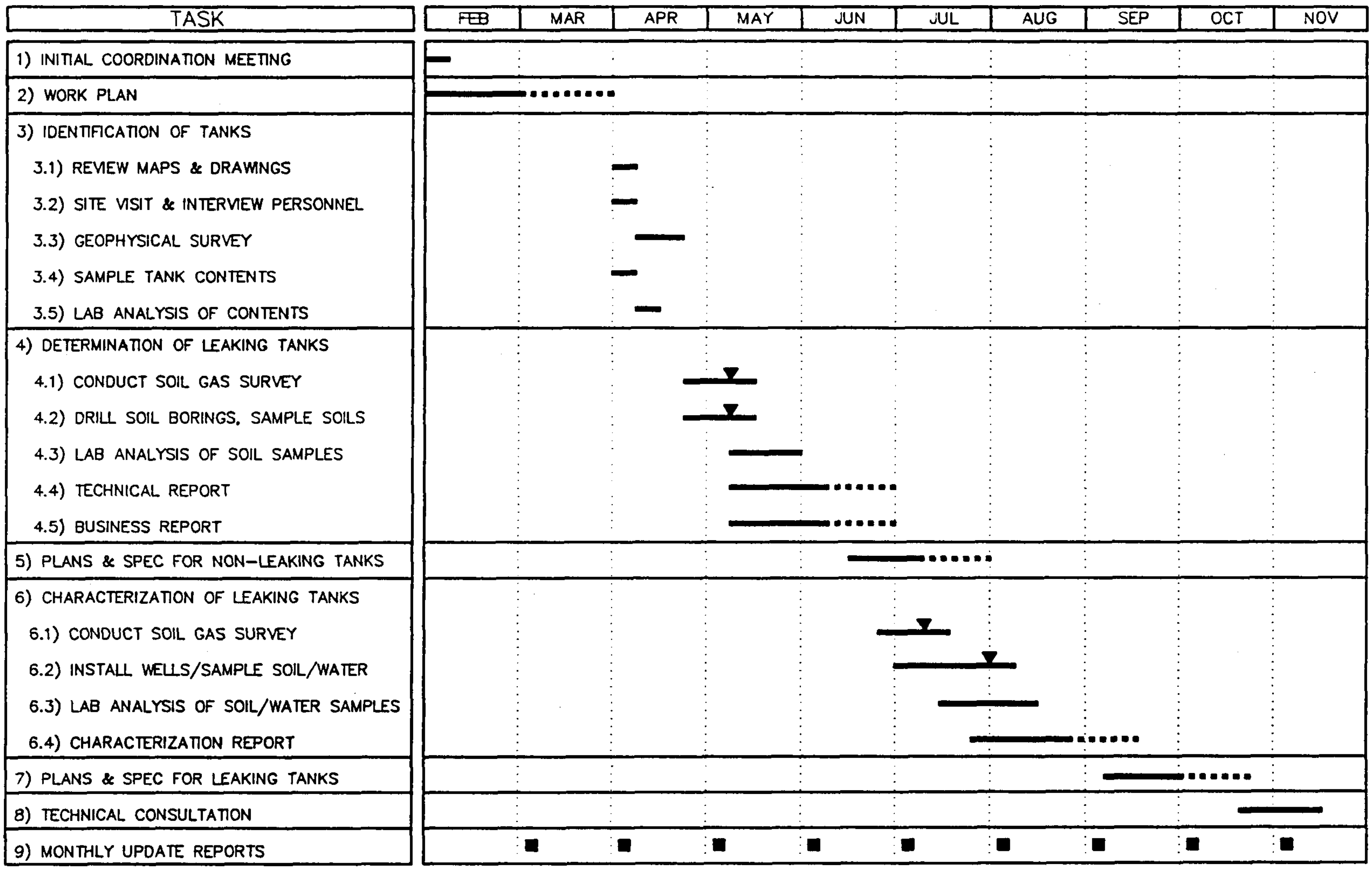
A site health and safety plan for the Underground Tank Investigation has been prepared by IT as Work Plan Volume III. This section summarizes the site-specific safety information.

Personnel taking part in field activities will have health and safety training and take part in a medical surveillance program. Prior to each days operations a safety meeting will be held at the site with all personnel involved in that phase of work. The purpose of the safety meeting will be to discuss the specific hazards associated with the work at the site, to describe the appropriate measures that deal with the work hazards (such as protective clothing and monitoring equipment), and to discuss emergency procedures. The location of emergency equipment such as fire extinguishers and first-aid kits will be addressed. The location of telephones and appropriate emergency telephone numbers will also be discussed. A list of emergency phone numbers and directions to Hospitals are included in the Health and Safety Plan Volume IV.

Level D protection is planned at all sites. Basic Level D protection includes coveralls, a hardhat, safety boots, and gloves. Organic vapors and explosive gases will be monitored during drilling operations. If measured levels exceed set criteria, modified Level C protection (with use of respirators) may be required.

6.0 SCHEDULE

The tentative schedule for conducting Underground Storage Tank Investigation as described in this plan, is included in the overall project schedule shown in Figure 6-1. This schedule does not allow for any major delays that unforseen circumstances might cause. Contingency plans will be developed before field implementation to minimize delays that might be caused by unpredictable problems such as severe weather or equipment breakdown.



LEGEND:

- LABOR INTENSIVE ACTIVITY
- INTERMITTENT AND/OR FOLLOW-UP WORK
- ▼ END OF FIELD WORK
- ■ MONTHLY UPDATE REPORT
- * SUBJECT TO THE APPROVAL OF THE REGULATORY AGENCIES

FIGURE 6-1
TENTATIVE PROJECT SCHEDULE *
PREPARED FOR
NAVSTA, TI, HUNTERS POINT ANNEX
SAN FRANCISCO, CA.

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DRAWN BY J.A.C. 4-28-88
CHECKED BY SAW 4/28/88
APPROVED BY SAW 9/28/88
DRAWING NUMBER 409617-B1

7.0 REFERENCES

Bonilla, M.G., 1971, "Preliminary Geologic Map of the San Francisco South Quadrangle and Part of the Hunters Point Quadrangle, California." USGS Miscellaneous Field Studies Map MF-311.

Harding Lawson Associates, 1988, "Work Plan Volume 2C, Sampling Plan - Group III Sites, Remedial Investigation/Feasibility Study, Naval Station, Treasure Island, Hunters Point Annex, San Francisco, California," report prepared for U.S. Navy, WESTDIV, February.

Lowney/Kaldreer Associates, 1972, "Foundation Investigation, Water Pollution Abatement Facilities, Hunters Point Naval Shipyard," report prepared for U.S. Navy, WESTDIV.

APPENDIX A

PHOTOVAC TIP I

STANDARD OPERATING PROCEDURES

APPENDIX A

PHOTOVAC TIP I
STANDARD OPERATING PROCEDURE

TITLE: Photoionization Detection Analysis of Soil Gas for Volatile Halogenated and Aromatic Hydrocarbons by Use of the PHOTOVAC TIP I

PREPARED BY: ______________________________ Date: __________________

APPROVED BY: ______________________________ Date: __________________

1.0 Scope and Application
The PHOTOVAC TIP I (TIP) is applicable to the detection of volatile organic compounds (VOC) to 0.1 ppm in soil gas samples.

2.0 Summary
Soil gas VOC content is measured from the gas photoionization capacity. Air is continuously sampled by the TIP's air suction pump into the ionization chamber. Instrument readings provide overall volatile content.

3.0 Limitations
The TIP does not distinguish between different pollutants, but rather provides a composite of the total ionizables present, hence the instrument's T.I.P. acronym. Instrument readings may be reported as equivalent to the specific compound used for calibration.

4.0 Apparatus
The TIP packs all necessary components in a single flashlight-sized casing, weighing about three pounds, and including nozzle, filter, air pump, ionization chamber, UV lamp, electrometer, LCD window, zero/span controls, power switch, and battery pack with external connections to 12 volt DC power or recharge capability.

TIP accessories include a headset, 1/4-inch ID teflon tubing, a Tedlar bag, and a Span Gas tank. The Tedlar bag has a one-liter capacity and is fitted with a quick fill valve and septum sampling port. The Span Gas is isobutylene. Accessory items may be used for sample collection and analysis, or in the preparation of calibration standards.

5.0 Sample Collection and Analysis

- Soil gas sampling perforations are made by driving 3/8-inch diameter rods into the ground.
- Insert a 1/4-inch ID perforated steel probe leaving at least 6 inches of probe above ground.
- Seal the annular space between probe and ground.

- Connect a portable air suction pump to the probe and evacuate between 5 to 10 liters of soil gas.

- Disconnect the air pump.

For the following steps refer to Figure 3.3 Pictorial Diagram in the TIP User's Manual for the position of controls.

- Press POWER switch to turn on the TIP.

- Unlock ZERO and SPAN controls by turning locking rings clockwise.

- Set SPAN control to 5.

- Lock SPAN control by turning locking ring counterclockwise.

- Allow the TIP to sample clean air.

- Adjust ZERO control until liquid crystal display (LCD) reads 0.00.

- Lock ZERO control by turing locking ring counterclockwise - confirm that zero reading is unchanged.

- Connect the TIP nozzle to the probe with the Teflon tubing

- Observe sample concentration changes on LCD display, or hear the changes in frequency using the headset connected to the TIP. Record concentration when stable readings are obtained.

- Do not allow TIP to draw in any liquid.

- Press POWER switch after use to turn off the TIP.

6.0 Instrument Calibration

The TIP is used as a direct-reading instrument in conjunction with the Span Kit (Part No. TA103). Calibration of the instrument will proceed as follows:

- Press POWER switch to turn on the TIP.

- Unlock ZERO and SPAN controls by turning locking rings clockwise.

- Set SPAN control to 5.

- Allow the TIP to sample clean air.

- Adjust ZERO control until LCD reads 0.00.

- Connect bag of Span Gas to the TIP inlet.

- Adjust SPAN control until LCD indicates the Span Gas concentration (nominal -- 100 ppm isobutylene (2-methyl-1-propene)). Disconnect Span Gas bag.

- Sample clean air again and readjust ZERO control until LCD reads 0.00, if necessary.

- Lock SPAN control by turning locking ring counterclockwise. Disconnect Span Gas bag.

- Observe sample concentration changes on LCD. Concentration of total ionizables is displayed in Span Gas equivalent units.

- Do not allow the TIP to draw in any liquid.

- Press POWER switch after use to turn off the TIP.

7.0 Quality Assurance

- Duplicate sample analyses are performed for each 10 sample analyses after a 5-minute minimum resting period. Results of duplicate analyses are properly recorded in the daily logs. A minimum of one duplicate analysis per day is required.

- Blank sample analyses are performed for each 10 sample analyses after a 5-minute minimum resting period. Results of blank sample analyses are properly recorded in the daily log. A minimum of one blank analysis per day is required.

- Instrument calibration is required three times a day: at the beginning of the work day, in the middle of the day, and at the end of the day.

8.0 Reporting

- Daily logs with recorded concentration readings are submitted to the site project supervisor at the end of each work day.

- Copies of the will be sent to IT Martinez, Project Manager. Originals are maintained in the central project files at IT Knoxville, Tennessee.

PROJECT PLAN FOR
UNDERGROUND TANK INVESTIGATION
NAVAL STATION TREASURE ISLAND,
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

VOLUME III: QUALITY ASSURANCE/QUALITY CONTROL PLAN

September 16, 1988

Prepared by

IT CORPORATION

Submitted by:

HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
MARTIN MARIETTA ENERGY SYSTEMS, INC.
OAK RIDGE, TENNESSEE 37931

for

U.S. DEPARTMENT OF ENERGY
CONTRACT DE-AC05-840R21400

Submitted to:

DEPARTMENT OF THE NAVY
WESTERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
SAN BRUNO, CALIFORNIA 94066-0720

UNDERGROUND TANK INVESTIGATION WORK PLAN
NAVAL STATION, TREASURE ISLAND, HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

VOLUME III: QUALITY ASSURANCE/QUALITY CONTROL PLAN

Prepared by

IT CORPORATION

September 16, 1988

Approved: John Q. McGuire — Project Manager, IT Corporation — Date: Sept. 16, 1988

Approved: Kenneth R. Porter — Deputy Program Manager, IT Corporation — Date: Sep 16, 1988

Approved: John Q. McGuire For — Quality Assurance Coordinator — Date: Sept 16, 1988

MA:ENG:3384/09148

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(Continued)

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LIST OF ACRONYMS

CGI - Combustible Gas Indicator
CIH - Certified Industrial Hygienist
CPR - Cardio Pulmonary Recussitation
DA - District Attorney
DHS - Department of Health Services
DOT - Department of Transportation
Energy Systems - Martin Marietta Energy Systems, Inc.
EPA - Environmental Protection Agency
HAS - Health and Safety
HPA - Hunters Point Annex
HSO - Health and Safety Officer
IAS - Initial Assessment Study
IDLH - Immediately Dangerous to Life and Health
IT - International Technology Corporation
LEL - Lower Explosive Limit
LUFT - Leaking Underground Fuel Tank
MSDS - Material Safety Data Sheet
MSL - Mean Sea Level
NIOSH - National Institute for Occupational Safety and Health
OSHA - Occupational Safety and Health Administration
PCB - Polychlorinated Biphenyls
PEL - Permissible Exposure Levels
QA/QC - Quality Assurance/Quality Control
RWQCB - Regional Water Quality Control Board
SCBA - Self Contained Breathing Apparatus
SCF - Standard Cubic Foot
THV - Threshold Limit Value
WestDiv - Western Division

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this quality assurance/quality control (QA/QC) plan is to document the methods that will be used to ensure that the work performed at the identified underground storage tanks and the subsequent analytical work will accomplish the required objectives in the statement of work document. IT will conduct these activities under the management direction of Martin Marietta Energy Systems, Inc. (Energy Systems). This plan is responsive to the requirements of the U.S. Navy, Western Division (WESTDIV) Naval Facilities Engineering Command for the Navy Storage Tank Investigation Program related activities at Naval Station, Treasure Island, Hunter's Point Annex (HPA), San Francisco, California.

The scope of this QA/QC plan encompasses all environmentally related measurement activities identified by WESTDIV for the assessment of environmental contamination related to underground storage tanks and the preparation of plans and specifications for removal and remediation of the tanks. This QA/QC plan is based, in part, on the Interim Guidelines and Specifications for the Preparation of Quality Assurange Project Plans, QAMS-005/80. The implementation of this QA/QC plan will provide the control necessary to ensure the precision, accuracy, and completeness of the data generated during the underground storage tank investigation.

The IT Environmental Projects Group quality assurance program addresses all aspects of a site investigation project which affect the quality of the end product. The IT Analytical Services (ITAS) QA Manual and the ITAS Cerritos laboratory-specific quality assurance manual identifies the policies and procedures which define acceptable practices applicable to environmentally related analytical laboratory activities. The IT Engineering Operations quality assurance manual, supplemented with this QA/QC plan and the IT laboratory quality assurance manual, provides the controls necessary to satisfy the statement of work.

1.2 PROJECT DESCRIPTION

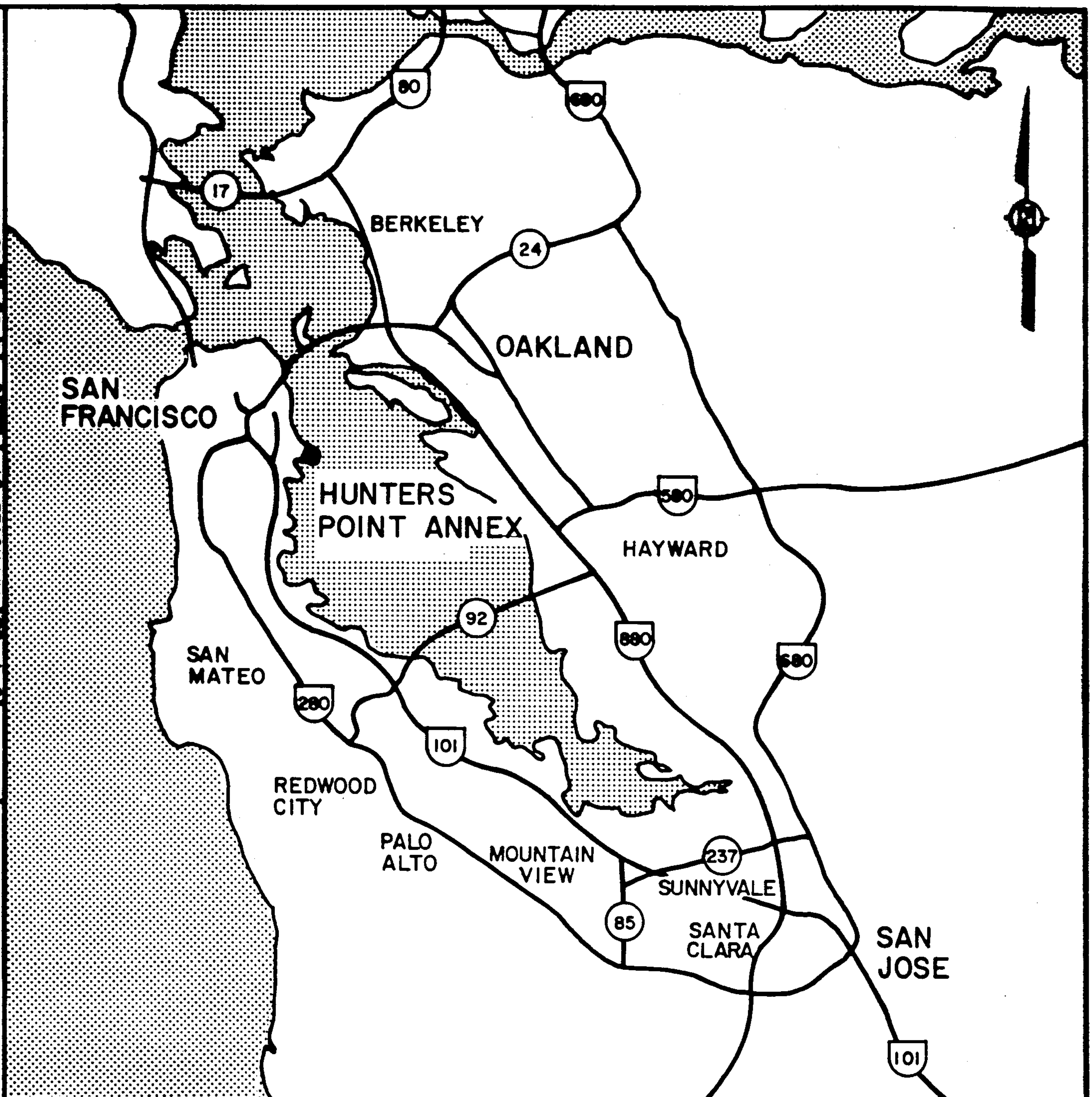
HPA, located in southeastern San Francisco at the tip of a peninsula extending eastward into San Francisco Bay (Figure 1-1), was disestablished by the U.S. Navy in June 1974. In 1976 most of the Navy-owned property at Hunters Point was leased to Triple A Machine Shop, Inc., which currently operates the facility as a commercial shipyard. WESTDIV has identified 26 underground storage tanks to be investigated under this project. This project will provide an assessment of the environmental contamination resulting from the operation of the underground storage tanks and plans and specifications for removal of the tanks and remediation of the tank sites. The ultimate objective of this activity is to bring the tank sites into compliance with the closure regulations under California Administrative Code, Title 23, Chapter 3, Subchapter 16, Underground Tank Regulations.

1.3 SITE DESCRIPTION

HPA covers approximately 965 acres. The land portion of the property comprises about 572 acres, with the remaining 393 acres located in San Francisco Bay. The peninsula on which the facility is located is bounded on the west by the Bay View/Hunters Point districts of San Francisco. These districts are developed with residential housing and commercial/industrial buildings.

1.4 PROJECT SCHEDULE

Project sample activities and schedule are presented in Volume II of the Project Plan. (Sampling Plan)



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CHECKED BY
APPROVED BY
DRAWN BY

FIGURE 1-1

SITE LOCATION MAP

PREPARED FOR

NAVAL STATION, TREASURE ISLAND
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

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12807

"Do Not Scale This Drawing"

2.0 PROJECT ORGANIZATION

Project, field, and laboratory personnel are directly subject to the requirements of this quality assurance/quality control (QA/QC) plan.

2.1 AUTHORITY AND RESPONSIBILITY

The responsibilities of key technical positions for this project are described in the following sections.

2.1.1 Project Manager

The project manager will be the prime point of contact for this work and will have primary responsibility for technical, financial, and scheduling matters. The project manager's duties include:

- Communicating proposed variances in the QA/QC plan or sampling plan to the quality assurance coordinator
- Assigning duties to the project staff and orienting the staff to the needs and requirements of the project
- Providing any necessary training for the project staff in project requirements
- Supervising the performance of project team members
- Providing budget and schedule control
- Monitoring subcontractor work and approving of subcontract invoices
- Establishing a project records system
- Reviewing project deliverables for technical accuracy and completeness before their release
- Assuring compliance with specific requirements of the QA/QC plan
- Regularly communicating project status, progress and any nonconformances or other problems to the quality assurance coordinator.

2.1.2 Deputy Project Manager

The deputy project manager's responsibilities include:

- Providing sufficient resources to the project team so that it can respond fully to the requirements of the investigation
- Providing direction and guidance to the project manager as appropriate
- Reviewing the quality of the data gathered during the course of the project and reviewing the final project report
- Other responsibilities as directed by the project manager.

2.1.3 Quality Assurance Coordinator

Responsibilities of the quality assurance coordinator include:

- Actively tracking the progress of quality tasks in this plan and consulting periodically with the Project Manager, the Program Manager and the Quality Assurance Officer.
- Being the official contact for quality assurance matters for the project
- Actively identifying and responding to QA/QC needs, resolving problems, and answering requests for guidance or assistance
- Reviewing, evaluating, and approving quality related changes to the QA/QC plan and sampling plan
- Actively tracking the progress of quality tasks and consulting with the project manager and program manager
- Preparing and submitting QA/QC reports to the project manager and program manager.
- Ensuring that appropriate corrective actions are taken for all nonconformances
- Verifying that appropriate methods are specified for obtaining data of known quality and integrity
- Scheduling and performing an appropriate quality assurance verification activity for each site to ensure compliance with requirements and procedures
- Other responsibilities as requested by the project manager
- Implementing the overall IT Quality Assurance Program as presented in the IT Environemntal Projects Group QA Manual
- Implementing and verifing on a generic basis, the provisions of the IT Environmental Projects Group QA Manaual

- Preparing office/group, as needed, quality related procedures
- Perform independent project-specific QA audits
- Ensuring that appropriate corrective actions are taken for all nonconformances.

2.1.4 Health and Safety Coordinator

The health and safety coordinator will be responsible for seeing that site personnel adhere to the site safety requirements. Additional responsibilities are included in the project Health and Safety plan, Volume III. In the absence of the health and safety coordinator, the field supervisor will assume the role of the health and safety coordinator.

2.1.5 Field Operations Coordinator

The field operations coordinator will be responsible for:

- Providing orientation and training to field personnel (including subcontractors) on the requirements of the sampling plan and QA/QC plan prior to start of work each day
- Providing direction and supervision to the drilling subcontractor during the drilling of soil borings and installation of monitoring wells
- Coordination of field documentation
- Ensuring that the drilling subcontractor and sampling personnel adhere to the QA/QC plan and sampling plan
- Ensuring use of calibrated measurement and test equipment, and that proper labeling, handling, storage, shipping, and chain-of-custody procedures are used at the time of sampling
- Establishing and maintaining a field records system
- Coordinating activities with the project manager
- Other responsibilities as directed by the project manager.

2.1.6 Laboratory Coordinator

The Laboratory Coordinator will be responsible for the laboratory implementing the requirements of this QA/QC Plan. The Laboratory Coordinator's responsibilities will, as appropriate, include:

- Providing orientation and any necessary training to laboratory personnel on the requirements of the Work Plan, QA/QC Plan, and Sampling Plan
- Collaborating with the project staff in establishing sampling and testing programs
- Serving as liaison between the laboratory staff and other groups
- Serving as the "collection point" for laboratory staff reporting of nonconformances and changes in laboratory activities
- Notifying the laboratory and quality assurance personnel of specific laboratory nonconformances and changes
- Maintaining laboratory data and checkprints while the project, or testing phase, is in progress
- Preparing and submitted QA/QC reports to the Laboratory Manager
- Releasing testing data and results
- Calibration of equipment
- Storage and control of samples.

2.2 SUBCONTRACTOR ACTIVITIES

The selection of qualified subcontractors will be in accordance with the IT Procurement and Quality Assurance procedures. Subcontractors, such as drillers, geophysical specialists, surveyors, and environmental monitoring specialists, must meet predetermined qualifications developed by the project manager. These qualifications are defined in the procurement bid packages. Each subcontractor's bid submittal will be reviewed by technical, purchasing, and quality assurance personnel to ensure that the bidders are qualified and can satisfy bid requirements. Subcontractors involved in environmental measurements will be monitored by the field operations coordinator to ensure use of calibrated equipment and qualified operators.

2.3 QUALIFICATIONS AND TRAINING OF PERSONNEL

Personnel assigned to the project, including field personnel and subcontractors, will be qualified to perform the tasks to which they are assigned. Besides education and experience, specific training could be required to

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PARAGRAPH 2-4
QUALITY ASSURANCE REPORTS TO MANAGEMENT

PROJECT PLAN FOR UNDERGROUND TANK INVESTIGATION

THE ABOVE IDENTIFIED PARAGRAPH IS NOT AVAILABLE.

EXTENSIVE RESEARCH WAS PERFORMED BY NAVFAC SOUTHWEST TO LOCATE THIS PARAGRAPH. THIS PAGE HAS BEEN INSERTED AS A PLACEHOLDER AND WILL BE REPLACED SHOULD THE MISSING ITEM BE LOCATED.

FOR ADDITIONAL INFORMATION,
PLEASE CONTACT:

DIANE C. SILVA, RECORDS MANAGER
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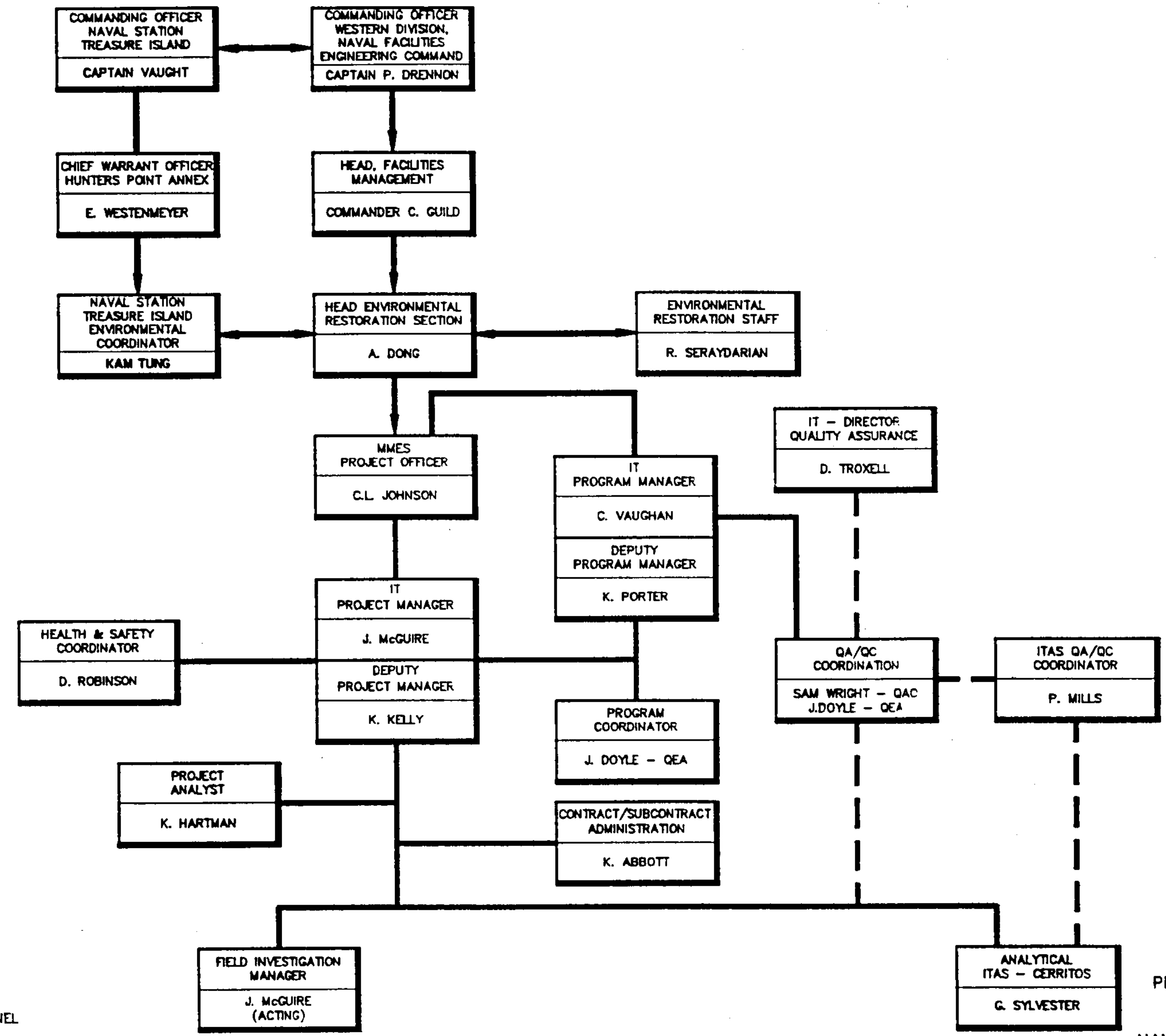
qualify individuals to perform certain activities. Training will be documented on the appropriate form and placed in the project file as a record. Project personnel will receive an orientation to the sampling plan and QA/QC plan as appropriate to their responsibilities before participation in project activities. The orientation will be documented.



LEGEND :

- • = KEY PERSONNEL
- M = MAXIMA
- QAO = QUALITY ASSURANCE OFFICER
- QEA = QUALITY ENGINEERING ASSOCIATES
- ITAS = IT ANALYTICAL SERVICES
- ——— = DIRECT LINE OF RESPONSIBILTY
- — — = LINE OF COMMUNICATION

FIGURE 2-1

PROJECT ORGANIZATION CHART

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NAVAL STATION, TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

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DRAWN BY J.A.C. 4-29-88

CHECKED BY JPM

APPROVED BY SPM

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT OF DATA

The purpose of this QA/QC Plan is to facilitate the implementation of the requirements of the Statement of Work and applicable regulatory requirements and to provide internal means for control and review so that the environmentally related measurements and data collected by IT and its subcontractors are scientifically sound, defensible, and of known acceptable documented quality.

Project objectives are that:

- Scientific data generated will be of sufficient quality to withstand scientific and legal scrutiny
- Data will be gathered or developed in accordance with procedures appropriate for its intended use
- Data will be of known precision, accuracy, representativeness, completeness, detection limits, and comparability within the limits of the project.

To assure that these objectives are met, the procedures to be used for assessing the quality of the measurement data are as follows:

- Accuracy and Precision - which is the agreement between a measurement and the true value and the degree of variability in the agreement, respectively.

  To determine the precision of the method and/or laboratory analyst, a routine program of replicate analysis is performed. The results of the replicate analyses are used to calculate the relative percent difference (RPD), which is the governing quality control parameter for precision.

  For replicate results $R_1 + R_2$

$$RPD = \frac{R_1 - R_2}{\frac{R_1 + R_2}{2}} \times 100\%$$

  To determine the accuracy, the evaluation is applied over the entire range of spiking concentrations. To determine the accuracy of an analytical method and/or the laboratory analyst, a periodic program of sample spiking is conducted (minimal 1 spike and 1 spike duplicate per 20 samples). The results of sample spiking are used to calculate the quality control parameter for accuracy evaluation, the percent recovery (% R).

$$100\% \times \frac{S_i - S_S}{T_i} = \%R$$

S_i = Observed Sample Concentration Spiked
S_S = Sample Concentration
T_i = True concentration of the spike.

Accuracy and precision of data collected in the investigation will depend upon the measurement standards used and the meticulous, competent use of them by qualified personnel.

- Completeness - which is the adequacy in quantity of valid measurements to prevent misinterpretation and to answer important questions. For this project the data completeness objective is 90%.

- Representativeness - which is the extent to which discrete measurements accurately describe the greater picture they are intended to represent.

  For this project good representativeness will be achieved through careful, informed selection of sampling sites, drilling sites, drilling depths, and analytical parameters; and through the proper collection and handling of samples to avoid interferences and to minimize contamination and loss.

- Comparability - which is the extent to which comparisons among different measurements of the same quantity or quality will yield valid conclusions. For this project comparability among measurements will be achieved through the use of standard procedures and standard field data sheets.

- Detection Limits - which is the extent to which the equipment, laboratory, field, or analytical process can provide accurate, minimum data measurements of a reliable quality for specific constituents. Tables 3-1 and 3-2 list the analytical detection limits. The actual detection limit in a given analysis will vary depending on instrument sensitivity and matrix effects.

- Traceability - which is the extent to which data can be substantiated by hard-copy documentation. Traceability documentation exists in two essential forms: one that links quantification to authoritative standards and a second that explicitly describes the history of each sample from collection to analysis.

The fundamental mechanisms that will be employed to achieve these quality goals can be categorized as prevention, assessment, and correction. These include:

- Prevention of defects in the quality through planning and design, documented instructions and procedures, and careful selection of skilled, qualified personnel
- Quality assessment through a program of regular audits and inspections to supplement continual informal review
- Permanent correction of conditions adverse to quality through a closed-loop corrective action system.

This QA/QC Plan has been prepared in direct response to these goals. This plan describes the Quality Assurance Program to be implemented and the quality control procedures to be implemented by IT and its subcontractors.

Detection Limits are presented in Tables 3-1 and 3-2. Sample Precision, Accuracy, and Completeness Objectives are listed in Table 3-3. The Matrix Spike Recovery Limits are listed in Table 9-1. The quality assurance objectives for laboratory quality control (QC) data are designed to screen out data of unacceptable precision or accuracy.

In addition, the Field Operations Coordinator will provide detection limits for each constituent analyzed in the field. Each laboratory will provide detection limits for each constituent analyzed. The method detection limit (MDL) is defined as the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the value is above zero. The MDL concentrations are usually determined using uncontaminated reagent water. Similar but higher limits can be achieved using representative wastewaters. The MDL actually achieved in a given analysis will vary depending on instrument sensitivity and interferences. The objective for data completeness is 90 percent. The objectives for precision and accuracy for each chemical are based mainly on the capabilities of the approved EPA analytical method with respect to laboratory QC.

For field QC data, no quality assurance objectives have been established by the EPA. Field QC data will be maintained primarily for descriptive purposes and data variability. The Quality Assurance Coordinator will be responsible for reviewing and evaluating the field QC data.

Soil borings and well locations were chosen to represent the areas of interest at the site. Because of the procedures used to collect samples, store, and transport them to the laboratory, the samples will be as representative as possible of actual conditions given current standard practices.

Similar samples will be collected using consistent sampling methods, analyzed using consistent analytical procedures, and reported in conventional units (e.g., mg/kg or μg/L). Therefore, the data will be comparable throughout the project.

TABLE 3-1
ANALYTICAL DETECTION LIMITS[a,b]

PARAMETER	METHOD NO.	LOW[e] WATER[c] (mg/L)	METHOD No.	LOW[e] SOIL/SEDIMENT[d] (mg/kg)
Total Petroleum Hydrocarbons Volatiles	DHS Method[1]	0.5	DHS Method[1]	10.0
Total Petroleum Hydrocarbons Semi & Non Volatiles	DHS Method[1]	0.5	DHS Method[1]	10.0
Tetraethyl lead (organo-lead)	DHS Method[1]	0.02	DHS Method[1]	2.0
Ethylene dibromide	EPA 601[2]	0.0005	EPA 8010[3]	.005
pH	150.1[2]	0.1 SU	--	--
Specific Conductance	120.1[2]	1 Ohm os/cm	--	--

[a] Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable. CLP Scope of Work 785.

[b] Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the contract, will be higher.

[c] Medium Water Contract Required Detection Limits (CRDL) for Volatile TCL Compounds are 100 times the individual Low Water CRDL.

[d] Medium Soil/Sediment Contract Required Detection Limits (CRDL) for Volatile TCL Compounds are 100 times the individual Low Soil/Sediment CRDL.

[e] CLP Definition, <10 ppm of target compound.

[1] Leaking Underground Fuel Tank (LUFT) Field Manual, December 1987. Appendix B.

[2] "Methods for Chemical Analysis of Water Wastes," EPA-600/4-79-020, latest edition.

[3] "Test Methods for Evaluating Solid Waste," EPA, SW-846-2nd Edition.

TABLE 3-2
ANALTYCIAL DETECTION LIMITS
VOLATILE ORGANIC COMPOUNDS

PARAMETER	CAS NUMBER	METHOD	DETECTION LIMITS[a,b] LOW[e] WATER[c] UG/L	LOW[e] SOIL/SEDIMENT[d] UG/KG
Chloromethane	74-87-3	8240	10	10
Bromomethane	74-83-9	8240	10	10
Vinyl chloride	75-01-4	8240	10	10
Chloroethane	75-00-3	8240	10	10
Methylene chloride	75-09-2	8240	5	5
Acetone	67-64-1	8240	10	10
Carbon disulfide	75-15-0	8240	5	5
1,1-Dichloroethene	75-35-4	8240	5	5
1,1-Dichloroethane	75-35-3	8240	5	5
trans-1,2-Dichloroethene	156-60-5	8240	5	5
Chloroform	67-66-3	8240	5	5
1,2-Dichloroethane	107-06-2	8240	5	5
2-Butanone	78-93-3	8240	10	10
1,1,1-Trichloroethane	71-55-6	8240	5	5
Carbon tetrachloride	56-23-5	8240	5	5
Vinyl acetate	108-05-4	8240	10	10
Bromodichloromethane	75-27-4	8240	5	5
1,1,2,2-Tetrachloroethane	79-34-5	8240	5	5
1,2-Dichloropropane	78-87-5	8240	5	5
trans-1,3-Dichloropropene	10061-02-6	8240	5	5
Trichloroethene	79-01-6	8240	5	5
Dibromochloromethane	124-48-1	8240	5	5
1,1,2-Trichloroethane	79-00-5	8240	5	5
Benzene	71-43-2	8240	5	5
cis-1,3-Dichloropropene	10061-01-5	8240	5	5
Bromoform	75-25-2	8240	5	5
2-Hexanone	591-78-6	8240	10	10
4-Methyl-2-pentanone	108-10-1	8240	10	10
Tetrachloroethene	127-18-4	8240	5	5

TABLE 3-2
ANALYTICAL DETECTION LIMITS
VOLATILE ORGANIC COMPOUNDS
(Continued)

PARAMETER	CAS NUMBER	METHOD	DETECTION LIMITS[a,b] LOW[e] WATER[c] UG/L	LOW[e] SOIL/SEDIMENT[d] UG/KG
Toluene	108-88-3	8240	5	5
Chlorobenzene	108-90-7	8240	5	5
Ethyl benzene	100-41-4	8240	5	5
Styrene	100-42-5	8240	5	5
Total xylenes		8240	5	5

[a]Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable. CLP Scope of Work 785.

[b]Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the contract, will be higher.

[c]Medium Water Contract Required Detection Limits (CRDL) for Volatile TCL Compounds are 100 times the individual Low Water CRDL.

[d]Medium Soil/Sediment Contract Required Detection Limits (CRDL) for Volatile TCL Compounds are 100 times the individual Low Soil/Sediment CRDL.

[e]CLP Definition, < 10 ppm of target compound.

Reference: EPA Contract Laboratory Program (CLP)
Contract Required Detection Limits (CRDL)

TABLE 3-3
SAMPLE PRECISION, ACCURACY, AND COMPLETENESS OBJECTIVES

MEASUREMENT PARAMETER	SAMPLE MATRIX	PRECISION OBJECTIVE (% AVERAGE RPD)[a]	ACCURACY OBJECTIVE (%)	COMPLETENESS OBJECTIVE (%)	REFERENCE METHOD
Volatile Organics	Water	<15	As per current CLP	90	EPA CLP
Volatile Organics	Solids	<25	As per current CLP	90	EPA CLP
Specific Conductance	Water	<25	Analyze in Duplicates	90	EPA 120.1
pH	Water	<25	Analyze in Duplicates	90	EPA 150.1
Total Petroleum Hydrocarbons	Water	<25	NA	90	LUFT
	Solids	<25	NA	90	LUFT
Tetraethyl Lead	Water	<25	NA	90	LUFT
	Solids	<25	NA	90	LUFT
Ethylenedibromide	Water	<25	70-130 Ave. Recovery	90	EPA 601[b]
	Solids	<25	70-130 Ave. Recovery	90	RCRA 8010[c]

[a] Applied to all samples of the same type from the same location.
[b] Leaking Underground Fuel Tank (LUFT) Field Manual, California State Water Resources Control Board, DEC. 1987.
[c] US EPA "Test Methods for Evaluating Solid Waste" SW846, 3rd ed, 1984.

NA = Not Available. Criteria to be developed during project.

4.0 SAMPLING PROCEDURES

A detailed Project Sampling Plan has been prepared to document the scope and rationale of exploration and the sampling activities at the Hunter's Point Facility. The Sampling Plan is presented as a stand-alone document and is as Volume I of the Work Plan.

The following considerations form the basis for the site-specific sampling program:

- Selection of sampling and drilling sites
- Frequency of sampling
- Location and number of monitoring stations to be sampled
- Methods of sampling to be employed
- Media to be sampled
- Number of samples to be collected
- Volume of samples to be collected
- Type and kind of analyses to be performed in the field
- Type and kind of analyses to be performed at the laboratories
- Sample turnaround time
- Procedures and precautions to be followed during sampling
- Methods of preservation and shipment.

Sampling will be frequent enough to identify materials and to describe important material changes. Methods of sampling employed shall preserve the integrity of material parameters.

Any sample obtained during field sampling should be representative of the sample location and free of contaminants from sources other than the immediate environment being sampled. The equipment and the techniques that will be employed to obtain representative samples will be in accordance with IT's standard operating procedures.

The Sampling Plan describes sampling locitons; the numbers of types of samples to be collected; sampling equipment, procedures, and sample containers; methods of sample preservation; decontamination procedures; shipping and packaging methods; and a sample schedule. Analytical tests that will be performed are also described. Table 4-1 lists containers, preservatives, and holding times for each type of analysis to be performed on the project and is in accordance with the current revision of Table II of 40 CFR 136.3 (7-1-86 Edition).

The EPA has developed specific procedures for the preparation of sample containers to be used for site investigations. These procedures are part of the EPA contract "Superfund Sample Container Repository" which is held by a contractor. Containers will be purchased from the contractor, who will specifiy that said containers meet all EPA protocals including cleaning QC release. Specific cleaning procedures may be obtained through the US EPA samples management office.

4.1 PREVENTION OF CROSS CONTAMINATION

To prevent sample contamination and cross contamination, the drill rig, sampling tools, and sampling equipment will be decontaminated before entering each tank site, between drilling the boreholes, before sampling, and before leaving the shipyard. Each decontamination activity will be recorded on the Field Activity Daily Log (Figure 4-1). Detailed procedures for decontamination of drilling and sampling equipment and disposal of decontamination by-products are provided in the sampling plan.

4.2 SAMPLE IDENTIFICATION AND COLLECTION

Samples collected as part of this project will be recorded on a Sample Collection Log (Figure 4.2). Samples will be containerized in sample containers that have been cleaned, treated with preservative if required, and prelabeled by the IT laboratory. The labels on containers provided by the laboratory will state the type of preservative, if any, and the sample type for which the container is intended. As samples are collected and sealed in containers, sample containers will be marked as indicated in Section 4.1.3 of the sampling plan. After collection, identification, and preservation, the sample will be maintained under the chain-of-custody procedures.

4.3 SAMPLE TURNAROUND TIME

Sample turn around time will be based primarily on the analytical method holding times.

4.4 FIELD DOCUMENTATION

An integral part of field activities will include maintaining a Field Activity Daily Log (Figure 4-1). Information identified on the log is obtained from site exploration and sampling activities and will be documented by the field supervisor.

All information pertinent to field activities will be recorded in the Field Activity Daily Log. Entries in the log will be made using water-resistant ink, and corrections will be made using a single-line strike-out. Entries will include as a minimum:

- The names and affiliations of field personnel
- A general description of the day's field activities
- Documentation of weather conditions during the previous 48 hours
- Field equipment calibration data
- Field measurements such as temperature, pH, conductance, and readings from personnel safety instruments.

Appropriate field generated data forms will be prepared based on the sampling plan. Data to be recorded will include such information as the monitored location (e.g., boring, well, depth, sampling station, elevation, drill cutting discoloration and odor) and applicable sample analysis to be conducted. Equipment that may be used in the field for testing is listed on Table 6-2, Summary of Field Equipment to Calibration Requirements.

4.5 VARIANCE SYSTEM

Procedures that properly address all specific conditions encountered during a field program cannot be prepared. Variances from approved operating procedures in the sampling plan or QA/QC plan will be documented on a Variance Log (Figure 4-3). The field supervisor will initiate and chronologically maintain the Variance Log. The variances must be approved by the Project Manager and the Quality Assurance Coordinator before work proceeds. Any variance from the health and safety plan must also be signed off by the health and safety coordinator. Approval by the project manager can be initiated on a verbal basis via telephone with follow-up sign-off. In no case will an IT subcontractor initiate a variance. If a variance is proposed by the client, it will be so recorded but will require approval of the Project Manager and QA Coordinator. Copies of the Variance Log will be kept on site until the field work is complete and then will be sent to the project files.

4.6 FIELD DATA MANAGEMENT

The intended use of field data is to assess the nature of the site and the extent of potential problems resulting from past activities at the site and to identify, evaluate, and recommend appropriate actions.

Numerical analyses, instrument readings and recordings, measurements and tests will be documented and subjected to internal review. Field records will be legible and sufficiently complete to permit reconstruction of field activities by a qualified individual other than the originator. Field generated data sheets are collected and reviewed for accuracy and completeness by the field supervisor. The data sheets are assembled by the field supervisor into packages that represent each borehole, monitoring well, etc. These data sheet record packages are sent to the IT project management office in Knoxville, Tennessee for review, examination, analysis of data, and for the technical staff to use in preparing the required reports. Reporting of field data will be included in the internal underground tank investigation report, which will be approved by the project manager, the quality assurance coordinator, and the deputy project manager.

4.7 DECONTAMINATION OF EQUIPMENT AND SUPPLIES

Specific decontamination procedures are addressed in the Sampling Plan, Volume II. Refer to the specific sections of sampling procedures and methods.

TABLE 4-1
SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

ANALYSIS	SAMPLE TYPE	CONTAINER	PRESERVATIVE	HOLDING TIME
Volatile Organic Compounds	Water	2-40 mL amber glass vials Teflon-backed septum No head space	Cool to 4°C add 2 drops 1:1 HCl	7 days to extract; analysis within 30 days
	Soil	Brass sleeve or 250 mL glass jar	Cool to 4°C	7 days to extract; analysis within 30 days
Total Petroleum Hydrocarbons - Volatiles	Water	2-40 mL vials Teflon-backed septum No head space	Cool to 4°C add 2 drops 1:1 HCl	14 days
	Soil	1 sleeve, brass	Cool to 4°C	14 days
Total Petroleum Hydrocarbons Semi & Non Volatile	Water	2-40 mL vials Teflon-backed septum No head space	Cool to 4°C add 2 drops 1:1 HCl	14 days to extract; analysis within 40 days
	Soil	1 sleeve, brass	Cool to 4°C	14 days to extract; analysis within 40 days
Tetraethyl lead	Water	1 L poly	Cool to 4°C	14 days
	Soil	1 sleeve, lexan	Cool to 4°C	14 days
Ethylene dibromide	Water	2-40 mL vials Teflon-backed septum No head space	Cool to 4°C add 2 drops 1:1 HCl	14 days
	Soil	brass sleeve	Cool to 4°C	14 days

TABLE 4-2
FIELD MEASUREMENT AND TEST EQUIPMENT LIST

INSTRUMENT TO BE CALIBRATED	STANDARD REFERENCE	CALIBRATION TECHNIQUE	ACCEPTANCE SPECIFICATIONS
HNu photoionization detector (PID)	Gas standard kit	Refer to IT equipment calibration instruction, C1-2	Meter indicates standard ppm concentrations and zero setting
Explosimeter, MSA Combustible Gas and Oxygen Alarm, Model 621	261 Calibration kit	Refer to IT calibration instruction, C1-3	LEL meters reads 47-55 percent Oxygen meter reads 20-8 percent

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DAILY LOG			
DATE			
NO.			
SHEET	OF		

FIELD ACTIVITY DAILY LOG

PROJECT NAME	PROJECT NO.
FIELD ACTIVITY SUBJECT:	
DESCRIPTION ON DAILY ACTIVITIES AND EVENTS:	
VISITORS ON SITE:	CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS.
WEATHER CONDITIONS:	IMPORTANT TELEPHONE CALLS:
IT PERSONNEL ON SITE:	
(FIELD ENGINEER) DATE	

FIGURE 4-1

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FIGURE 4-2

DATE						
TIME						
PAGE ____ OF ____						
PAGE						
PROJECT NO.						

SAMPLE COLLECTION LOG

PROJECT NAME ______________________________

SAMPLE NO. ______________________________

SAMPLE LOCATION ______________________________

SAMPLE TYPE ______________________________

COMPOSITE ______ YES ______ NO

COMPOSITE TYPE ______________________________

DEPTH OF SAMPLE ______________________________

WEATHER ______________________________

CONTAINERS USED	AMOUNT COLLECTED

COMMENTS:

PREPARED BY: ______________________

IT CORPORATION

Figure 4-3

VARIANCE LOG

PROJECT NUMBER ______________________ PAGE _____ OF _____

PROJECT NAME ______________________

DATE	VARIANCE GRANTED AND APPLICABLE DOCUMENT	RESPONSIBLE INDIVIDUAL

5.0 SAMPLE CUSTODY PROCEDURES

Evidence of sample collection, shipment, laboratory receipt, and laboratory custody until disposal will be documented on a Chain-of-Custody Record (Figure 5-1). A sample is considered in custody if it is:

- In a person's actual possession
- In transit
- In view, after being in physical possession
- Locked, so that no one can tamper with it, after having been in physical custody
- In a secured area restricted to authorized personnel.

The Chain-of-Custody Record is to be used by IT personnel in collecting and shipping samples. The IT laboratory will not accept samples collected by IT personnel for analysis without a correctly prepared Chain-of-Custody Record and a Request for Analysis form (Figure 5-2).

5.1 FIELD CUSTODY PROCEDURES

Field custody procedural activity includes:

- Before sampling begins, the field supervisor will instruct site personnel in the Chain-of-Custody procedures, as necessary.
- The quantity and types of samples and sample locations have been determined and are outlined in the sampling plan.
- The field operations coordinator has the responsibility for ensuring that proper custody procedures are implemented and that appropriate report forms were used during the field work.
- The field supervisor has overall responsibility for the care and custody of the samples collected until they are transferred or properly dispatched to the laboratory. Each individual who collects a sample is responsible for sample custody until transferred to someone else via the Chain-of-Custody Record.

- Shipment information is recorded for shipment of samples at the end of the shift, day, or collection period on the Field Activity Daily Log.

5.2 SAMPLE LABELING

Sample labels must contain sufficient information to uniquely identify the sample in the absence of other documentation. Labels will include as minimum:

- Project name and number
- Unique sample number
- Sample location
- Sampling date and time
- Signature of individual collecting the sample
- Preservation method employed.
- Analytical method
- Sample type

The sample label will be directly affixed to the sample container and will be completed using indelible ink. An example of the sample labels to be used for this project is shown in Figure 5-3.

5.3 TRANSFER OF CUSTODY AND SHIPMENT

Transfer of custody and shipping procedures include:

- A Chain-of-Custody Record will be initiated in the field for each sample. A copy of this record will accompany each sample.

- In the event that the laboratory sample custodian judges sample custody to be invalid (e.g., samples arrive damaged), a Nonconformance Report (Figure 13-1) will be initiated. The project manager and quality assurance coordinator will be notified. The project manager will make a decision as to the fate of the sample(s) in question. The sample(s) will either be processed "as is" with custody failure noted along with the analytical data or rejected with sampling rescheduled if necessary. The project manager and quality assurance coordinator will sign-off the Nonconformance Report, noting the reason for disposition.

- Each time responsibility for custody of the sample changes, the new custodian will sign the record and note the date.

- The custody of individual sample containers will be documented by recording each container's identification on an appropriate Chain-of-Custody Record.

- The analyses to be performed for each sample will be recorded on a Request for Analysis form.

- Upon sample destruction or disposal, the custodian responsible for the disposal will complete the Chain-of-Custody Record, file a copy, and send a copy to the project manager or to his designated representative for record keeping.

5.4 LABORATORY RECEIPT AND ENTRY OF SAMPLES

Upon receipt at the laboratory, the sample is removed from the shipping container and the sample identification is compared to the information contained on the Chain-of-Custody Records. If discrepancies exist, appropriate notes (signed and dated) are made on the Chain-of-Custody Record and the shipping and receiving supervisor is notified.

The following items are checked upon receipt of samples with the Chain-of-Custody Record:

- The seals and tapes on the cooler are unbroken and uncut.

- The sample containers in the cooler are intact.

- The identification on the sample bottles corresponds to the entries on accompanying forms.

- The number of sample containers received (i.e., bottles) is equal to the number of samples listed on the chain-of-custody or accompanying forms. Samples are identified by giving each "Job" a unique number.

Identification numbers are stamped on stickers and securely wrapped about each sample.

5.5 PRE-ANALYSIS STORAGE

Personnel from the ITAS Cerritos laboratory receive and log in the samples. These personnel have the responsibility of picking up from shipping and receiving samples that are specific to their group. Samples are then placed into temporary storage until analysis.

Samples are stored as prescribed in the IT Cerritos laboratory-Specific Quality Assurance Manual. Methods of storage are intended generally to:

- Retard biological action
- Retard hydrolysis of chemical compounds and complexes
- Reduce volatility of constituents
- Reduce absorption effects.

5.6 POST-ANALYSIS STORAGE

Anticipation of re-analysis prescribes proper environmental control. Instructions for post-analysis storage and disposal are indicated on the Request for Analysis form.

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CHAIN-OF-CUSTODY RECORD

R/A Control No. ______

C/C Control No. 001773

PROJECT NAME/NUMBER ______ LAB DESTINATION ______

SAMPLE TEAM MEMBERS ______ CARRIER/WAYBILL NO. ______

Sample Number	Sample Location and Description	Date and Time Collected	Sample Type	Container Type	Condition on Receipt (Name and Date)	Disposal Record No.

Special Instructions: ______

Possible Sample Hazards: ______

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By: ______

   Received By: ______

2. Relinquished By: ______

   Received By: ______

3. Relinquished By: ______

   Received by: ______

4. Relinquished By: ______

   Received By: ______

WHITE - To accompany samples
YELLOW - Field copy

FIGURE 5-1

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REQUEST F ANALYSIS

R/A Control No. 03 03
C/C Control No. ____________

PROJECT NAME ____________________
PROJECT NUMBER ____________________
PROJECT MANAGER ____________________
BILL TO ____________________
____
____
PURCHASE ORDER NO. ____________________

DATE SAMPLES SHIPPED ____________________
LAB DESTINATION ____________________
LABORATORY CONTACT ____________________
SEND LAB REPORT TO ____________________
____
____
DATE REPORT REQUIRED ____________________
PROJECT CONTACT ____________________
PROJECT CONTACT PHONE NO. ____________________

Sample No.	Sample Type	Sample Volume	Preservative	Requested Testing Program	Special Instructions

TURNAROUND TIME REQUIRED: (Rush must be approved by the Project Manager.)

Normal ________ **Rush** ________ (Subject to rush surcharge)

POSSIBLE HAZARD IDENTIFICATION: (Please indicate if sample(s) are hazardous materials and/or suspected to contain high levels of hazardous substances)

Nonhazard ________ **Flammable** ________ **Skin Irritant** ________ **Highly Toxic** ________ **Other** ________________ **(Please Specify)**

SAMPLE DISPOSAL: (Please indicate disposition of sample following analysis. Lab will charge for packing, shipping, and disposal.)

Return to Client ________ **Disposal by Lab** ________

FOR LAB USE ONLY

Received By ____________________ **Date/Time** ____________________

WHITE - Original, to accompany samples
YELLOW - Field copy

FIGURE 5-3

INTERNATIONAL
TECHNOLOGY
CORPORATION

F
H R

Project Name ____________________

Project No. ____________________

Sample No. ____________________

Collection Date/Time ____________________

Collector's Name ____________________

Sample Location ____________________

Sample Type/Depth/Description ____________________

Analyze For __________ Preservative __________

Bottle ______ of ______ ______ Filtered ______ Nonfiltered

23-8-85

6.0 CALIBRATION PROCEDURES AND FREQUENCY

6.1 GENERAL CALIBRATION PROCEDURES AND FREQUENCY

Laboratory and field measuring and testing equipment will be identified and calibrated in accordance with the requirements of Section 5.5 of IT's Environmental Projects Group QA Manual, Contract Laboratory Program (CLP), and IT's (Cerritos) Laboratory Specific Quality Assurance Manual when CLP protocol is not established. Measuring equipment, test equipment, and reference standards will be calibrated at prescribed intervals and/or before use. Calibration frequency will be based on the analytical methods employed, the type of equipment, inherent stability, manufacturer's recommendations, values given in national standards, intended use, and experience. Laboratory instrument calibration frequency will be performed as dictated by the CLP contract. Table 6-1 identifies the laboratory equipment that will require calibration when used. A summary of typical field equipment calibration requirements and frequency of procedures is provided in Table 6-2.

In some cases, particularly for field equipment, scheduled periodic calibration will not be performed because the equipment is not continuously in use. Such equipment will be calibrated on an "as needed" basis prior to use, and then at the required frequencies for as long as its use continues.

Calibrated equipment will be uniquely identified by using either the manufacturer's serial number or other means. A label with the identification number and the date when the next calibration is due will be attached to the equipment. If this identification is not possible, records traceable to the equipment will be readily available for reference.

6.2 CALIBRATION FAILURES

Scheduled periodic calibration of testing equipment will not relieve field or laboratory personnel of the responsibility of employing properly functioning equipment. If an individual suspects an equipment malfunction, he should remove the device from service, tag it so it is not inadvertently used, and notify the Laboratory Coordinator or Field Operations Coordinator as appropriate, so that recalibration can be performed or substitute equipment can be obtained.

Equipment that cannot be calibrated or becomes inoperable during use will be removed from service and either segregated to prevent inadvertent use, or tagged to indicate it is out of calibration. Such equipment will be repaired and recalibrated or replaced as appropriate. Any such action should be reported in the field activities daily log or appropriate laboratory log.

6.3 CALIBRATION RECORDS

Records will be prepared and maintained for each piece of calibrated measuring and test equipment and each piece of reference equipment to indicate that established calibration procedures have been followed. Records for equipment used will be kept in the project files.

Much of the measuring and test equipment used for field geophysical surveys is calibrated or checked as part of the operational use. For this equipment, records of the calibrations or checks will be kept in the files of projects for which the work was performed, or as part of the responsible organization's calibration record system.

TABLE 6-1
SUMMARY OF TYPICAL EQUIPMENT CALIBRATION REQUIREMENTS FOR
ITAS LABORATORY OPERATIONS

INSTRUMENT TO BE CALIBRATED	STANDARD REFERENCE	CALIBRATION TECHNIQUE	ACCEPTABLE PERFORMANCE SPECIFICATIONS
Atomic absorption spectrophotometry	Three levels plus one blank, bracketing the sample concentrations; certified standards from chemical supply house are used	Direct reading using serial standard	As per current CLP dilution of commercial
Analytical balances	Class "S" weight check	Annual or as needed out of house service to calibrate	At least every 3 months, one must meet 95 percent confidence using Class "S" weight
Gas chromatography (GC)	Three levels plus one blank; at least one level of reference standard at theoretical concentration of sample	(±) 95 percent of the original curve	As per current CLP
Gas chromatography/ mass spectrometry (GC/MS)	All in-house solutions. (DFTPP), (SPCC), and (CCC)	Reference standards, retention	As per current CLP time, and additive percent recovery for surrogates
Inductively coupled plasma spectrophotometer	Certified standards from chemical supply house	Serial dilutions of commercial	As per current CLP standards; direct readouts
Amber Science Model 1051 Conductivity meter	Buffer solution of known conductivity (1000 mhos)	Refer to IT equipment calibration instruction, C1-1	Standard solution value

Linearity for IC is accomplished by plotting 5 points and applying the correlation coefficient. The criteria is 0.997 or better. Linearity for IR is accomplished by plotting 7 points. Each standard is analyzed in duplicate and at two separate concentrations (4x for each standard). The criteria is 0.997 or better.

TABLE 6-2
SUMMARY OF TYPICAL FIELD EQUIPMENT CALIBRATION REQUIREMENTS

INSTRUMENT TO BE CALIBRATED	STANDARD REFERENCE	CALIBRATION TECHNIQUE	ACCEPTABLE PERFORMANCE SPECIFICATIONS
Beckman #21 pH/temperature meter	Two buffer solutions pH-4, pH-7 or pH-10	Refer to IT equipment calibration instruction, C1-4	Buffer solution values
Photovac TIP I	Gas standard kit	Refer to IT equipment calibration instruction, C1-2	Meter indicates standard ppm concentrations and zero setting
Electric tape	NA	Battery check	Audio check
Conductivity Meter	NA	Battery check	Audio check
Explosimeter, MSA Combustible Gas and Oxygen Alarm, Model 621	261 Calibration kit	Refer to IT calibration instruction, C1-3	LEL meters reads 47-55% Oxygen meter reads 20.8%
HNU Photoionization detector (PID)	Gas Standard Kit	Refer to IT equipment calibration, C1-2	Meter indicates standard ppm concentration and zero

7.0 ANALYTICAL PROCEDURES

7.1 OVERVIEW OF STANDARD LABORATORY OPERATING PROCEDURES

Actions that are routinely followed when analyzing samples include:

- Holding times and the amount of sample available are reviewed and the analyses prioritized.
- Analyses will be performed within holding times according to accepted procedures.
- A calibration curve consisting of at least three standards and a reagent blank will be prepared as specified in the methodology.
- Preparation and analysis of at least one procedural blank will be completed for each group of samples analyzed.
- At least one matrix spike and matrix spike duplicate will be analyzed for every 20 samples processed to monitor the percent recovery and accuracy of the analytical procedure.

The analytical procedures for the analyses required by the Sampling Plan, Volume II, are referenced in the respective IT Analytical Services (ITAS) laboratory manual. The ITAS Cerritos, California laboratory meets all certification requirements for this project.

7.2 ORGANIC COMPOUNDS

The required organic analyses will be performed by the IT's Cerritos laboratory. The instrumental techniques employed will be gas chromatography/mass spectrometry (GC/MS), gas chromatography with electron capture detector (GC/ECD), flame ionization detector (GC/FID), and photoionization detector (GC/PID). The Cerritos laboratory participates in the EPA Contract Laboratory Program (CLP) for organic analyses.

For soil samples requiring volatile analysis the following sub-sampling technique will be followed: The brass/lexan sleeves are turned upright and uncapped. The top half-inch layer of soil is discarded. The actual analytical sample is obtained by taking a soil core (approximately 2 inches long by 0.5 inches in diameter) from the center of the sleeve. Care is taken not to use soil which has contacted the sleeve walls.

If the soil sample is collected in 40 ml vials rather than sleeves, the vials will be filled as completely as possible to minimize headspace. The portion for volatile analysis is taken prior to any other laboratory analysis.

7.3 TETRAETHYL LEAD

The analysis for tetraethyl lead will be performed by the IT analytical laboratory. Analyses will be performed by inductively coupled plasma spectroscopy (ICP) or atomic absorption spectroscopy (AA).

7.4 ANALYTICAL METHODS AND PROCEDURES

The analtyical methods and procedures to be used for this project are listed in Table 7-1.

TABLE 7-1
ANALYTICAL METHODS

PARAMETER	METHOD NUMBER WATER	SOIL
Total Petroleum Hydrocarbons - Volatiles/BTX&E	DHS Method[1]	DHS Method[1]
Total Petroleum Hydrocarbons - Semi & Non Volatiles	DHS Method[1]	DHS Method[1]
Tetraethyl lead (organo-lead)	LUFT[1]	LUFT[1]
Ethylene Dibromide (EDB)	EPA 601[2]	8010[3]
Volatile Organic Compounds (VOCs)	EPA 8240	EPA 8240
pH	150.1[2]	--
Specific Conductance	120.1[2]	--

1 Leaking Underground Fuel Tank (LUFT) Field Manual, December 1987. Appendix B.

2 "Methods for Chemical Analysis of Water Wastes," EPA-600/4-79-020, latest edition.

3 "Test Methods for Evaluating Solid Waste," EPA, SW-846 3rd Revision.

8.0 DATA REDUCTION, VALIDATION, AND REPORTING

8.1 DATA REDUCTION AND VALIDATION

Data collected during the field activities will be validated by checking the procedures used and comparing the data to previous measurements. The Field Operations Coordinator will be responsible for checking field QC samples to ensure that field measurements and sampling protocol have been observed and adhered to. These checks will include:

- Use of standard operating procedures
- Calibration method and frequency
- QC bottle lot number
- Date/time sampled
- Preservation
- Samplers
- Laboratory
- Chain-of-custody number
- Date shipped
- Airbill number.

The field data will be reported in the following units:

- Water levels - Reported to the nearest 0.01 foot after two measurements agree
- pH - Digital reading rounded to 0.1 pH units
- Electrical conductivity - Reported to 100 micromhos/cm.

Data reduction, validation, and reporting will be performed as follows and as described in the ITAS Quality Assurance Manual and Laboratory-Specific attachments to the ITAS Manual. Analytical data are generated by the GC/MS computer software, the GC computer, the ICAP computer, AA, ion chromatograph, and associated laboratory instrumentation. Outputs include identifications of compounds, concentrations, retention times, and comparisons to standards. Outputs are in graphic form (chromatograms), bar graph (spectra), and printed tabular form in the standard formats specified for each analysis. If incomplete or incorrect outputs are received, corrective actions are taken according to procedures established for each type of analysis, consistent with manufacturer recommendations.

In the data review process, the data are compared to information such as the sample history, sample preparation, and quality control (QC) sample data to evaluate the validity of the results. Corrective action is minimized through the development and implementation of routine internal system controls. Analysts are provided with specific criteria that must be met for each procedure, operation, or measurement system.

Data validation includes dated and signed entries by analysts and group leaders on the worksheets and logbooks used for samples, the use of sample tracking and numbering systems to track the progress of samples through the laboratory, and the use of quality control criteria to reject or accept specific data.

Steps and checks used to validate precision and accuracy of the measured parameters and to support the representativeness, comparability, and completeness include:

- Description of the calibration performed
- Description of routine instrument checks (noise levels, drift, linearity, etc.)
- Documentation of the traceability of instrument standards, samples, and data
- Documentation of analytical methodology and QC methodology
- Description of the controls taken to determine and minimize interference contaminants in analytical methods (use of reference blanks and check standards for method accuracy and precision)
- Description of routine maintenance performed

- Documentation of sample preservation and transport when shipped elsewhere.

Laboratory validation responsibilities are as follows:

- Analyst - Responsible for the actual analyses performed. If several types of analyses are performed, there will be more than one analyst. The data is organized and placed into the job envelope.

- Analyst or Group Leader - Responsible for reviewing: data, calculations, and the results for 20 percent of all jobs. If an analyst performs this function, it is always a second independent analyst from the analyst performing the analyses. This person is responsible for initialing and dating each page reviewed. Records are to be kept in logbooks to track jobs reviewed.

- Analyst or Group Leader - Responsible for verifying that the results as reported have been correctly typed. The chemist verifying the typing is the same chemist who performed the analyses. In a job where more than one chemist has performed the analyses, the chemist working with the "main" group is responsible for signing the report.

- The Group Leader - Responsible for reviewing 100 percent of all reports to verify that the information, format, data, completeness and typing are correct. Revised reports, duplicate analyses and secondary group results are to be checked for comparable results as well. Initials of this person are to be placed at the bottom left corner of each report. This person is responsible for organizing the job envelope(s) for final review by the Lab Manager, Operations Manager, Technical Director or EPA Project Manager.

- QA/QC Coordinator - Responsible for reviewing at least 5 percent of all job envelopes. The QA/QC Coordinator verifies that all steps documented are accomplished as stated, and will take corrective action and proceed further with an investigation if the protocol is not adhered to.

- Lab Manager/Assistant Lab Manager - Ultimately responsible for the issued report. Final approval for release of the report is given and the report is then signed. The lab manager has the authority to designate specified personnel to manage this responsibility.

8.2 DATA REPORTS

The format and content of a data report is dependent upon project needs, such as: whether or not explanatory text is required, client or contract requirements, and government agency reporting formats. The IT Quality Assurance Program does not specify a report format; however, the following items are applicable to data presentation:

- The final data presentation shall be checked in accordance with data verification requirements and approved by the Laboratory Manager

- Data are presented in a tabular format whenever possible

- Data will be formatted as a Certificate of Analysis

- Each page of data is identified with the project number and name; date of issue; and, if appropriate, client name

- Data presentation includes:

  a. Sample identification number used by the ITAS-Cerritos laboratory and/or the sample identification provided to the laboratory, if different than identification used in the laboratory

  b. Chemical parameters analyzed, reported values, and units of measurement

  c. Detection limit of the analytical procedure if the reported value is less than the detection limit

  d. Data for a chemical parameter is reported with consistent significant figures for samples

  e. Results of quality control sample analysis if appropriate

  f. Achieved accuracy, precision, and completeness of data if appropriate

  g. Footnotes referenced to specific data if required to explain reported values.

  h. Analytical methods will be specifcally referenced on all laboratory reports. Any method modification will be included in the case narrative.

  i. Data for field QC samples reported in the same format as action samples. A modified CLP data package consisting of QA/QC summary data sheets will be provided for all internal laboratory QC samples.

  j. Laboratory data stored so that complete CLP data packages can be subsequently assembled for EPA designated review.

9.0 QUALITY CONTROL PROCEDURES

9.1 FIELD QUALITY CONTROL PROCEDURES

In order to check the quality of field data, quality control samples are collected for either laboratory or field analysis.

9.1.1 Soil and Water Samples

Field quality control (QC) sampling will be established to check sampling and analytical accuracy and precision and cross contamination during shipment. All QC samples will be shipped according to the Chain of Custody procedures specified in Section 5.3. Field QC samples will include the following types of samples:

- Duplicates
- Blanks and Background Samples
  - Equipment blank
  - Field Bottle Blank
  - VOA Travel Blank
  - Background.

Field QC samples will have discrete sample numbers and be submitted as "blind" to the laboratories. These samples will be analyzed as if they were original field samples. Results of these samples will be included in the analytical report.

Results for QC samples will not be used to adjust the results obtained for original samples. If contaminants are found in the blanks, attempts will be made to identify the source of contamination, and corrective action will be initiated.

9.1.1.1 Duplicates

A duplicate is a sample which is collected in parallel with its original sample for each analytical parameter. The procedure for obtaining the duplicate is identical to its original. The same container type, preservative and sampling technique are used.

Duplicate soil samples will be obtained by collecting two sets of samples with the California Modified Sampler for a total of six sleeves. Two sleeves adjacent to one another within the core barrel will be considered duplicates of one another.

For field duplicates no quality assurance objectives have been established by the EPA. Field QA/QC data will be maintained primarily for descriptive purposes.

For laboratory duplicates the relative percent difference (RPD) criteria are established by the CLP for the GC/MS volatile and semi-volatile methods, the GC pesticide method, and the inorganic methods. For criteria not yet statistically generated, the criteria will be set at 0-25 percent RPD.

A minimum of one sample or 10%/parameter/matrix/site whichever is greater will be collected from locations suspected of being contaminated.

9.1.1.2 Blank Samples

Blank samples are used to determine cross-contamination between sample collection and during shipment to the laboratory.

For liquids, the frequency of blank or background sample collection will be one sample/day/shipment/lab. Only one type of blank need be collected. The different types of blanks are listed below in order of collection preference.

9.1.1.3 Equipment Blank

After decontamination has been performed on sampling equipment, and prior to use, a reagent grade water rinsate is collected from the piece of equipment (e.g., a bailer, submersible pump). For soil gas, blank samples will be taken from the decontaminated syringes. Analysis of this type sample determines decontamination effectiveness.

9.1.1.4 Field Bottle Blank

A field bottle blank is HPLC/ASTM-Type 2-grade water which is transferred from its original container to a sample container at the sample location at the same time the original sample is taken. Theoretically, the transfer will expose the water to ambient contaminants which would be measured during lab analysis. A blank will be collected when decontamination of the equipment is not necessary or possible. The field blank will be analyzed for all parameters specified for the sample location.

9.1.1.5 VOA Travel Blank

These blanks consists of an HPLC/ASTM Type 2 grade water sample which is carried into the field by samplers along with actual samples, shipped to the laboratory, and analyzed exactly like all other samples. All VOA vials will be packed in the same cooler as the VOA blank.

9.1.1.6 Background Sample

Background samples will be collected and analysed for the complete analytical Suite. It is expected that one sample location will serve as background for both water and soil.

9.1.2 Photovac TIP

The following Photovac TIP QA/QC procedures will be followed according to the TIP Standard Operating Procedures in Appendix A of the Sampling Plan.

- TIP readings will be reported at each sampling point together with the GC reading for chlorinated compounds with the corresponding detection limits.
- Duplicate sample analyses are performed for each 10 sample analyses after a 5-minute minimum resting period. Results of duplicate analyses are properly recorded in the daily logs. A minimum of one duplicate analysis per day is required.
- Blank sample analyses are performed for each 10 sample analyses after a 5-minute minimum resting period. Results of blank sample analyses are properly recorded in the daily log. A minimum of one blank analysis per day is required.
- Instrument calibration is required three times a day: at the beginning of the work day, in the middle of the day, and at the end of the day.
- TIP calibration will be checked and recorded three times daily using appropriate gas standards.

After each reading the TIP will be thoroughly aerated until its decontamination is complete. Small adjustments may be necessary to correct for zero drift.

9.2 LABORATORY QUALITY CONTROL PROCEDURES

These control limits are specified in the Organic CLP SOW 787.

9.2.1 Volatile Organics

Samples for volatile organic compound analysis will be analyzed according to current EPA CLP procedures. An initial calibration curve will be prepared using a mixture of standards at five different concentrations and a mixture of three internal standards. Each GC/MS tune will be verified every 12 hours to ensure that its performance on bromofluorobenzene or DFTPP meets the applicable EPA criteria. The continuous calibration is also verified prior to sample analysis by re-analysis of the mid-range standard.

All standards, method blanks, and samples will be spiked before analysis with surrogate standards as specified in CLP procedures. Surrogate standards are defined as nonpriority pollutant compounds used to monitor the percent recovery efficiencies of the analytical procedures on a sample-by-sample basis. Samples exhibiting surrogate standard responses outside the established control limits will be re-analyzed. If the problem is not resolved by re-analysis, the project manager will be notified that resampling is required.

At least one method blank every 12 hours will be purged and analyzed for volatile organic compounds. Volatile organics analysis requires a method blank consisting of 5 milliliters of organic free water spiked with the appropriate surrogate standards. Results of the method blank analysis will be maintained with the corresponding sample analyses.

Matrix spike and matrix spike duplicate analyses will be performed on one of every 20 samples per matrix type analyzed. A separate aliquot of the sample will be spiked with the appropriate HSL compounds before extracting the sample. The percent recoveries for the respective compounds will then be calculated (Section 3.0, Page 3-1). If the percent recovery values fall outside the appropriate QC limits, the other QC parameters will be evaluated to determine whether an error in spiking occurred or whether the entire set of samples required repreparation and analysis.

The relative percent difference for each parameter will then be calculated from these matrix spike and matrix spike duplicate analyses. If the average relative percent difference falls outside the appropriate QC limits, the other QC parameters would be evaluated to determine whether the duplicate sample should be re-extracted and analyzed or whether the entire set of samples should be reprepared and analyzed. Table 9-1 lists the matrix spike limits.

9.2.2 Tetraethyl Lead

At least one method blank, consisting of reagent water and reagents used in the method, will be analyzed for every day of sampling.

Duplicate and matrix spike analyses will also be conducted at the same frequency as for the organics, though not necessarily on the same samples, due to potential sample volume limitations.

Evaluation of the QC data and any corrective action necessary will be the same as for the organics.

9.2.3 General Chemical Laboratory Controls

In addition to instrument calibration and the analysis of quality control samples, the following controls will be implemented:

- Reagents and solvents will be of certified composition. Reagent storage environment and duration will meet EPA guidelines.
- Laboratory equipment such as balances will be regularly calibrated with known standards.
- Volumetric measurements will be made with certified glassware.
- Data reduction and computations will be independently checked.
- Qualified personnel will be used for laboratory analyses.

- Sample holding times and storage provisions will conform to EPA guidelines.

The IT laboratory QA/QC Coordinator is responsible for preparing quality control standards. The coordinator will send quality control samples into the laboratory for analysis. Statistical analyses will then be performed utilizing the results of QC sample analyses.

The IT Cerritos Laboratory QA Manual (Section 10.0) describes the methodology used for the statistical evaluation of QC data. In general, IT laboratories will apply precision and accuracy criteria to each parameter that is analyzed. When analysis of a sample set is completed, the quality control data are reviewed and evaluated through the use of control charts to validate the data set.

Control charts may be established for all analytical parameters. A minimum of ten measurements of precision and accuracy are required before control limits can be established. Control limits of three standard deviations shall be utilized for all samples. Once established, control limits are updated as additional precision and accuracy data become available to the Quality Control Coordinator.

All precision and accuracy analyses will be calculated utilizing Northwest statpak, which uses ±3 STD deviations for the acceptable criteria limits. Additional statistics for organics CLP work will be done in accordance with SOW 787.

9.2.4 Laboratory Corrective Action

If the quality control limits are exceeded by any one quality control sample (method blank, duplicate matrix spike, equipment blank or check standard), corrective action will be taken as soon as a nonconformance is recognized. Corrective action may follow one or more of the following steps until the problem is solved:

- Recheck quantitation calculations.

- Reanalyze the nonconforming sample extract.
- Run a method blank to check instrument stability, solvent and reagent purity.
- Re-prepare and analyze the original field sample.
- If necessary, all real samples analyzed after the last conforming QC sample and prior to corrective action will be reanalyzed.

TABLE 9-1.
MATRIX SPIKE RECOVERY LIMIT[a]

PARAMETER/MATRIX SPIKE COMPOUND	METHOD	WATER	SEDIMENT/SOIL
Volatile Organics			
1,1-Dichloroethene	EPA 8240	61-145	59-172
Trichloroethene	EPA 8240	71-120	62-137
Chlorobenzene	EPA 8240	75-130	60-133
Toluene	EPA 8240	76-125	59-139
Benzene	EPA 8240	76-127	66-142
Total Petroleum Hydrocarbons	SFBR[b]	58-136	60-150
Tetraethyl Lead	SFBR[b]	50-125	50-125

[a]These limits are for advisory purposes only. If outside the limit, the QC Coordinator wll review the data (taking into consideration matrix type, dilution factors, intereferences, etc.) to decide whether reanalysis is required.

[b]SFBR - "Guidelines for Addressing Fuel Leaks," California Regional Water Quality Control Board, San Francisco Bay Region, September 1985, Attachment 2 Revisions.

10.0 PERFORMANCE AUDITS AND FREQUENCY

An individual audit plan will be developed to provide a basis for each audit. This plan will identify the audit scope, activities to be audited, audit personnel, any applicable documents, and the schedule. Checklists will be prepared by the auditors and used to conduct all audits. They will be developed to accomplish the review and to document the results of the audit.

Audits may involve an on-site visit by the auditor. Items to be examined may, as appropriate, include the availability and implementation of approved work procedures, calibration and operation of equipment; packaging, storage and shipping of samples obtained; performance documentation; and nonconformance documentation.

The records of operations will be reviewed to verify that laboratory and field-related activities were performed in accordance with appropriate approved procedures. Items reviewed will include, but would not be limited to, the calibration records of equipment, daily field activity logs, chain of custody documentation, and data resulting from field and laboratory operations.

10.1 FREQUENCY OF AUDITS

Audits will be scheduled to provide efficient monitoring of project activities. The Quality Assurance Coordinator is responsible for scheduling and performing audits. Preaudit and postaudit meetings will be conducted for related project personnel at the beginning and ending of audits. Within 20 working days of completion of an audit, the Quality Assurance Coordinator and/or his representative will prepare and submit an Audit Report. The report will be addressed to the Martin Marietta Energy Systems and IT Project Managers, Deputy Program Manager, and copies will be sent to the organization or group audited. Respectively, the preaudit meeting will review the scope, schedule, checklist, and related project documents; the post audit meeting will review the audit finding and recommendations for the correction.

Within 30 working days after receipt of the Audit Report, the IT Project Manager will prepare and submit to the Energy Systems Project Manager and the Quality Assurance Coordinator a reply to the audit. This reply will include, as a minimum, a plan for implementing the corrective action to be taken on nonconformances indicated in the Audit Report, the date by which such corrective action will be completed and actions taken to prevent reoccurrence. If the corrective action has been completed, supporting documentation should be attached to the reply. The Quality Assurance Coordinator will ascertain (by re-audit or other means) whether appropriate and timely corrective action has been taken. Re-audits will be conducted and reported in the same manner as the original audit.

Records of audits will be maintained in the project files. Audit files will include, as a minimum, the Audit Report, the reply to audit, and any supporting documents. It is the responsibility of the Project Manager to conform to the established procedures, particularly as to timely replies to audit reports and implementation of such corrective action as may be indicated.

10.2 PERFORMANCE AND SYSTEM AUDITS

Audits will be performed to review and evaluate the adequacy of field and laboratory performance, and to ascertain whether the QA/QC plan is being completely and uniformly implemented. The Quality Assurance Coordinator is responsible for such audits and will perform them according to a schedule planned to coincide with appropriate activities on the project schedule and sampling plans. Such scheduled audits may be supplemented by additional audits for one or more of the following reasons:

- When significant changes are made in the QA/QC plan
- When it is necessary to verify that corrective action has been taken on a nonconformance reported in a previous audit
- When requested by the Project Manager.

The objectives of performance and systems audits are to ensure that the quality assurance program developed for this project is being implemented according to the specified requirements, to assess the effectiveness of the quality assurance program, to identify nonconformances, and to verify that identified deficiencies are corrected. Upon discovery of any significant deviation from the quality assurance program, the Project Manager shall be informed of the nature, extent, and corrective action taken to remedy the deviation.

In addition to these internal audits, surveillance of selected activities may be performed on a periodic basis.

10.2.1 Performance Audits

A performance audit can be defined as a review of the existing project and quality control data to determine the accuracy of a total measurement system(s) or a component part of the system. The analysis of laboratory performance evaluation samples and the participation in schedule inter-laboratory studies may be included as part of the performance audit. Laboratory audits are further described in the ITAS Cerritos QA manual.

The IT Cerritos laboratory performs monthly internal audits covering all laboratory functions and activities. Performance audit reporting is summarized in a monthly report to the Technical Director and the Laboratory Manager and documented in project files.

10.2.2 Systems Audits

A systems audit consists of an evaluation to determine if the components of a measurement system(s) were properly selected and are being used correctly. A system audit includes a careful evaluation of field and laboratory quality control procedures.

System audits are conducted on a semi-annual basis. The system audit is reported in formal audit reports distributed by the Laboratory Manager.

10.2.3 Field Audits

An individual audit plan will be developed to provide a basis for each field audit. This plan will identify the audit scope, activities to be audited, audit personnel, any applicable documents, and the schedule. Checklists will be prepared by the auditors and used to conduct all audits. They will be developed to accomplish the review of necessary items and to document the results of the audit.

A field operations audit may involve an on-site visit by the auditor. Items to be examined may, as appropriate, include the availability and implementation of approved work procedures, calibration and operation of equipment; packaging, storage, and shipping of samples obtained; documentation procedures and instructions; and nonconformance documentation.

The records of field operations will be reviewed to verify that field-related activities were performed in accordance with appropriate procedures. Items reviewed may include, but are not limited to, the calibration records of field equipment, Daily Field Activity Logs, Chain-of-Custody Records, and data resulting from field operations.

Field audits will be conducted during the Tank Investigation site work. Field audit reports will be reported in formal audit reports distributed by the Project Manager.

During an audit and upon its completion, the auditor(s) will discuss the findings with the individuals audited and discuss and agree on corrective actions to be initiated.

Minor administrative findings which can be resolved to the satisfaction of the auditors during an audit are not required to be cited as items requiring corrective action. Findings that are not resolved during the course of the audit and findings affecting the overall quality of the project will be noted on the audit checklists and included in the audit report. Audit reports will also be sent to project files.

11.0 PREVENTIVE MAINTENANCE PROCEDURES

Periodic preventive maintenance is required for all sensitive equipment. Instrument manuals will be kept on file for reference purposes should equipment need repair. The troubleshooting section of factory manuals may be used in assisting personnel in performing maintenance tasks. The frequency of preventive maintenance for field equipment is usually indicated in each operating instruction manual. Otherwise, IT will indicate when routine maintenance checks are necessary so that failures in the field can be minimized.

Laboratory equipment requiring routine maintenance will have a control system indicating the date of required maintenance, person maintaining the equipment, and the next maintenance date. Information pertaining to life histories of equipment maintenance will be kept in individual logs for each instrument.

Major instruments in the laboratories are normally covered by annual service contracts with manufacturers. Under these agreements, regular preventive maintenance visits are made by trained service personnel. Maintenance will be documented and maintained in permanent records by the individual responsible for each instrument.

A listing will be maintained of the critical spare parts that should be on hand to minimize equipment downtime.

Specific laboratory and field equipment preventive maintenance practices, frequency, and spare parts are described in Table 11-1 and Table 11-2.

'LE 11-1
PREVENTIVE ... TENANCE REQUIREMENTS
FOR CERRITOS LABORATORY OPERATIONS

INSTRUMENT	ITEMS CHECKED/SERVICED	FREQUENCY	CRITICAL SPARE PARTS
Gas chromatograph	Replace column packing, clean detector, change glass wool plug, clean insert, replace septa, gas purity checks	Determined by analyst so that the calibration is within required specifications	See GC/MS
Atomic absorption spectrophotometer	3 point calibration performed, Burner head Nebulizer Tygon Tubing	Daily Daily Monthly 6 months	Nebulizers, contact rings, graphite tubes, quartz windows
Analytical balance	Internal weight, train, gears, electronics	Annual service	None
Inductively coupled plasma spectrophotometer	Sample introduction system Check pumps	Daily Weekly	Touches, nebulizers, pump tubing, torch collars (bonnets)
pH meters	Gel filled maintenance free	Daily check with 3 calibration standards	None
GC/MS Gap chromatograph/ maro spectrometer	GC/MS maintenance is the same as GC with the following additions		Analyzer parts: consumable parts, filaments, filters, septa, syringes, ferrules, gaskets O-Ring, etc. For printer: spare head, tape, ribbon, etc.
	1) For model 4000 and 5000		
	DP oil	Bi-weekly	
	Mech. oil	Quarterly	
	Power Con. Air Filter	Bi-weekly	
	QEM filter	Bi-weekly	
	Water bay filter	Bi-weekly	
	2010 Interface box	Bi-weekly	
	Vacuum chaff filter	Monthly	
	2) For OWA's		
	Water filter (if applicable)	Observe and change as needed	
	Computer air filter	Bi-monthly	
	Card gage air filter	Monthly	

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TABLE 11-2
PREVENTIVE MAINTENANCE REQUIREMENTS FOR FIELD EQUIPMENT

INSTRUMENT	ITEMS CHECKED/SERVICED	FREQUENCY	CRITICAL SPARE PARTS
pH meters	Gel filled probe, maintenance free	Daily check with 2 calibration standards	Probe, Battery
Photovac Tip 1	Maintenance free	NA	NA
Conductivity Meters	Maintenance free	Daily check with 3 calibration standards	Probe, Battery
Water Level Indicator	Cable length	Annually	None
HNu Photoionization detection (PID)	Maintenance free	NA	NA
Explusimeter, NSA Combustible Gas and Oxygen Alarm, Model 621	Maintenance free	NA	NA

12.0 STATISTICAL ASSESSMENT OF DATA QUALITY

The following discussion describes the procedures that will be employed to evaluate the precision, accuracy, and completeness of the chemical test data generated during the investigation.

Accuracy will be assessed by splitting a sample into two portions, spiking, (i.e., adding a known quantity of the constituents of interest to one of the portions), and then analyzing both portions for these parameters. The difference in the concentration levels of the constituents of interest should be equal to the quantity of the spike added to one of the two portions. The actual percent recovery is calculated as follows:

$$100\% \times \frac{S_i - S_s}{T_i} \; \%R$$

where S_i is the observed spiked sample concentration, S_s is the sample concentration and T_i is the true or actual concentration of the spike. One hundred percent recovery is equivalent to 100 percent accuracy. The coefficient of variation (C_v) of the percent recovery values is calculated as follows:

$$C_v = \frac{\text{Standard Deviation (SD)}}{\text{Mean (APR)}}$$

SD is the standard deviation of the percent recoveries for the various spiked constituents and APR is the average or mean percent recovery.

Precision will be assessed by conducting separate analyses of the duplicate spike samples. A measure of the agreement in the reported values for the two portions is obtained by calculating the relative percent difference (RPD) in the concentration levels of each constituent, where

$$RPD_i = \frac{A_i - B_i}{\frac{A_i + B_i}{2}} \times 100$$

and A_i and B_i are the concentrations of the constituent.

The evaluation of the test data is based in part on criteria adopted by the sample management office of the USEPA. These criteria provide a means of categorizing a data set as being quantitative, semiquantitative, or qualitative. Where applicable, IT will use data qualifiers to clearly identify (flag) results as qualitative and semi-qualitative. Otherwise, reported data is to be considered quantitative. They are as follows:

		Organics
Quantitative	APR	80% or greater
	Cv	20% or less
Semiquantitative	APR	60% or greater
	Cv	20 to 40%
Qualitative	APR	40% or better
	Cv	70% or less

		Inorganics
Quantitative	APR	90 to 110%
	Cv	15% or less
Semiquantitative	APR	80% or greater
	Cv	15 to 30%
Qualitative	APR	80% or less
	Cv	30% or greater

In addition to evaluating each set of data for accuracy and precision, an assessment will also be made of the completeness of the data. This assessment will involve computing the fraction of the reported values that remain valid after the sampling procedures have been reviewed and the results have been assessed for precision and accuracy. The quality assurance data objectives for the investigation relative to precision, accuracy, and completeness are described in Section 3.0.

For those analyses conducted using EPA CLP protocol, current acceptance criteria established by EPA will be used. These include recoveries of surrogate compounds added to each sample and recoveries of Target Compound List (TCL) compounds added to the matrix spike and matrix spike duplicate samples.

As part of the data assessment outlined above, precision and accuracy quality control charts will be established for all major analytical parameters. A minimum of 10 measurements of precision and accuracy are required before control limits can be established. In general, control limits will be updated as additional precision and accuracy data become available. Samples with relative percent differences or percent recoveries exceeding their respective control limits will be reanalyzed.

13.0 NONCONFORMANCES AND CORRECTIVE ACTION PROCEDURES

Nonconforming equipment, items, activities, conditions and unusual incidents that could affect compliance with project requirements will be identified, controlled, and reported in a timely manner. A nonconformance is defined as a malfunction, failure, deficiency, or deviation which renders the quality of an item unacceptable or indeterminate. The originator (any IT employee) of a Nonconformance Report (NCR) will describe the finding on the form provided for this purpose (Figure 13-1) and notify the Project Manager and Quality Assurance Coordinator. Each nonconformance will be reviewed and a disposition given for the item, activity, or condition. The disposition of a nonconformance will be documented and approved by the IT organization responsible for the issuance of the nonconformance. The Quality Assurance Coordinator will concur with the disposition of the nonconformance.

The Laboratory QA/QC Coordinator is responsible for assessment of quality control sample information. If data fall outside accepted limits, the QA/QC Coordinator will immediately notify the Operations Manager and the responsible Group Leader. If the situation is not corrected and an out-of-control condition occurs or is expected to occur, the QA/QC Coordinator will notify the Technical Director and the Laboratory Manager. The Operations Manager and Group Leaders are responsible for identifying the source of the nonconformance and initiating corrective action. Completion of corrective action should be evidenced by data returning to prescribed acceptable limits.

The modification, repair, rework, or replacement of nonconforming equipment, items, or activities will require the reverification of acceptability. In certain instances, as determined by the Project Manager, Program Manager, or Quality Assurance Coordinator, these actions may require that corrective action be completed and verified before site work continues.

The equipment, item, or activity which has the deficiency may be temporarily stopped while the nonconformance is being investigated. If in the opinion of the Project Manager and the Quality Assurance Coordinator the nonconformance does not significantly affect the technical quality or use of the work, the work may continue pending resolution of the nonconformance. The basis for such decisions will be documented on the Nonconformance Report and submitted to the Quality Assurance Coordinator for review and approval. The documentation will include the statement that the decision was made prior to continuing with the work. The records of nonconformance and their dispositions will be kept in the project central files.

In addition, the Project Manager will notify Martin Marietta Energy Systems, Inc. of significant nonconformances which could impact the schedule or results of the work, and will indicate the corrective action taken or planned.

FIGURE 13-1

INFORMATION REQUIRED
FOR

NONCONFORMANCE REPORT

PROJECT NO ____________ PROJECT NAME ______________________________

DATE ____________________ ORIGINATOR ______________________________

APPROVED BY ___________________________

REQUIREMENT

(Standard procedure, code, contractual, etc.)

NONCONFORMANCE

(Brief description of nonconformance: e.g., storage time exceeds standard [state time], calibration error, equipment failure, sample prep. error, and test procedure error)

CORRECTIVE ACTION

1. Persons notified—(Operations Manager, Project Manager, Laboratory Manager, etc.)
2. Impact of nonconformance.
3. Recommended action.
4. Corrective action taken—(verbal/written concurrence)

Original: Central Files (File No.______________)
cc: Project team, QAO, Others as appropriate

14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Fundamental to the success of this QA/QC Plan is the active participation of management in the project. Management will participate in development, review, and operation of the project and will be informed of project activities through the receipt, review, and/or approval of:

- Project specific quality assurance project plans
- Corporate and project-specific QA/QC plans and procedures
- Post audit reports and audit closures
- Corrective action overdue notices
- Nonconformance reports.

Section 10.0 describes the performance and systems audits process to be used during the project. In addition, periodic assessment of quality assurance/ quality control activities and data accuracy, precision, and completeness will be conducted and reported by the laboratory.

After the field work has been completed and the final analyses are completed and checked, a final quality assurance report will be prepared for project management. The report will summarize quality assurance and audit information, indicating any corrective actions taken and an assessment of the overall effectiveness of the QA/QC Plan.

The final report will be prepared by the Quality Assurance Coordinator include:

- Quality assurance management
- Measures of data quality from the project
- Significant quality problems, quality accomplishments, and status of corrective actions taken
- Results of quality assurance performance audits
- Results of quality assurance system audits

- Assessment of data quality in terms of precision, accuracy, completeness, representativeness, and comparability

- Quality assurance related training conducted during course of project

- Status of this Quality Assurance/Quality Control Plan.

Quality related project reports of this project will be sent to:

Project Manager
IT Corporation

Deputy Project Manager
IT Corporation

Director, Quality Assurance and
Discipline Services
IT Corporation

Project Manager
Martin Marietta Energy Systems

PROJECT PLAN FOR
UNDERGROUND TANK INVESTIGATION
NAVAL STATION TREASURE ISLAND,
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

VOLUME IV: HEALTH & SAFETY PLAN

SEPTEMBER 16, 1988

Prepared by:

IT CORPORATION

Submitted by:

HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
MARTIN MARIETTA ENERGY SYSTEMS, INC.
OAK RIDGE, TENNESSEE 37931

for:

U.S. DEPARTMENT OF ENERGY
CONTRACT DE-AC05-84OR21400

Submitted to:

DEPARTMENT OF THE NAVY
WESTERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
SAN BRUNO, CALIFORNIA 94066-0720

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VOLUME III - Quality Assurance/Quality Control Plan

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LIST OF ACRONYMS

CGI - Combustible Gas Indicator
CIH - Certified Industrial Hygienist
CPR - Cardio Pulmonary Recussitation
DA - District Attorney
DHS - Department of Health Services
DOT - Department of Transportation
Energy Systems - Martin Marietta Energy Systems, Inc.
EPA - Environmental Protection Agency
HAS - Health and Safety
HPA - Hunters Point Annex
HSO - Health and Safety Officer
IAS - Initial Assessment Study
IDLH - Immediately Dangerous to Life and Health
IT - International Technology Corporation
LEL - Lower Explosive Limit
LUFT - Leaking Underground Fuel Tank
MSDS - Material Safety Data Sheet
MSL - Mean Sea Level
NIOSH - National Institute for Occupational Safety and Health
OSHA - Occupational Safety and Health Administration
PCB - Polychlorinated Biphenyls
PEL - Permissible Exposure Levels
QA/QC - Quality Assurance/Quality Control
RWQCB - Regional Water Quality Control Board
SCBA - Self Contained Breathing Apparatus
SCF - Standard Cubic Foot
THV - Threshold Limit Value
WestDiv - Western Division

1.0 INTRODUCTION

It is the policy of IT Corporation to provide a safe and healthful work environment for all of its personnel and subcontractors. IT considers no phase of operations or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency or short cuts and every attempt will be made to reduce the possibility of injury, illness, or accident occurrence.

The purpose of the Health and Safety Plan is to: assign project personnel health and safety responsibilities, prescribe mandatory operating procedures: establish personal protective equipment requirements for this project, for alternative and contingency work items, for emergency response and for spill clean-up and abatement in order to successfully and safely perform investigation and remediation of the underground storage tanks at the Naval Station Treasure Island, Hunters Point Annex (HPA), San Francisco, California (Figure 1-1).

The proposed activities of this project can potentially expose site personnel to a variety of chemical and physical hazards. These hazards may include exposure to low level airborne contaminants (especially hydrocarbon vapors), petroleum product residues, noise, vibration, and being pinched or struck by moving or rotating equipment (such as earth moving equipment). To the extent feasible, such hazards will be addressed through engineering controls. The site Health & Safety Officer (HSO), shall assist field supervisors in identifying and controlling physical hazards not addressed by engineering controls.

Selected site personnel, engineers, and technicians will be evaluated by the site HSO for exposure to airborne contaminants. Techniques employed in this evaluation are discussed in Section 5.0. Results of all monitoring will be evaluated and compared with Federal and California Occupational Safety and Health Administration Permissible Exposure Levels (PELs) and American Conference of Governmental Industrial Hygienists Threshold Limit Values (TLVs). For each specific contaminant, the more restrictive (conservative) of these values shall be used as a determination of overexposure.

The provisions of this plan are mandatory for all site personnel and subcontractors assigned to the project. All authorized visitors to the site will be required to abide by these procedures. Work conditions can be expected to change as the operation progresses. As appropriate, addenda to the plan will be provided by the on site HSO. No changes to the plan will be implemented without prior approval of the site HSO.

This plan is in accordance with the OSHA Code 29 CFR Part 1910.120 and the following IT Health and Safety Policies and Procedures:

ITC	9000	Safety Policy
ITC	9001	Respiratory Protective Devices - Wearer Fit IT Policy
ITC	9020.1A	Accident Prevention Program - Inspection and Analysis
ITC	9020.2	Accident Prevention Program - Safety Inspection
ITC	9021.1A	Review of New Jobs, New Project, New Construction and Proposals
ITC	90301A	Employee and Contractor Training Requirements
ITC	9410.1D	Pre-employment Medical Examinations
ITC	9410.2B	Periodic/Update Medical Examinations
ITC	9532.9	Excavation and Trenching
ITC	9552.A	Hazards Communication Program
ITC	9561.C	Respiratory Protective Devices
ITC	9571	Fire Safety
ITC	9572	Electrical Safety
ITC	9591.1	Health and Safety Rules for Contractors
ITC	9650	Hearing Conservation Program

1.1 PROJECT DESCRIPTION

The Health and Safety Plan governs the field activities associated with the investigation and remediation of underground storage tanks at HPA. These activities include:

- Geophysical and magnetic survey
- Sampling of storage tank contents
- Soil gas survey of areas adjacent to tanks
- Underground utility survey before drilling

- Drilling of soil borings, and associated soil sampling
- Monitor wells installation
- Sampling of monitor wells
- Job hazard analysis

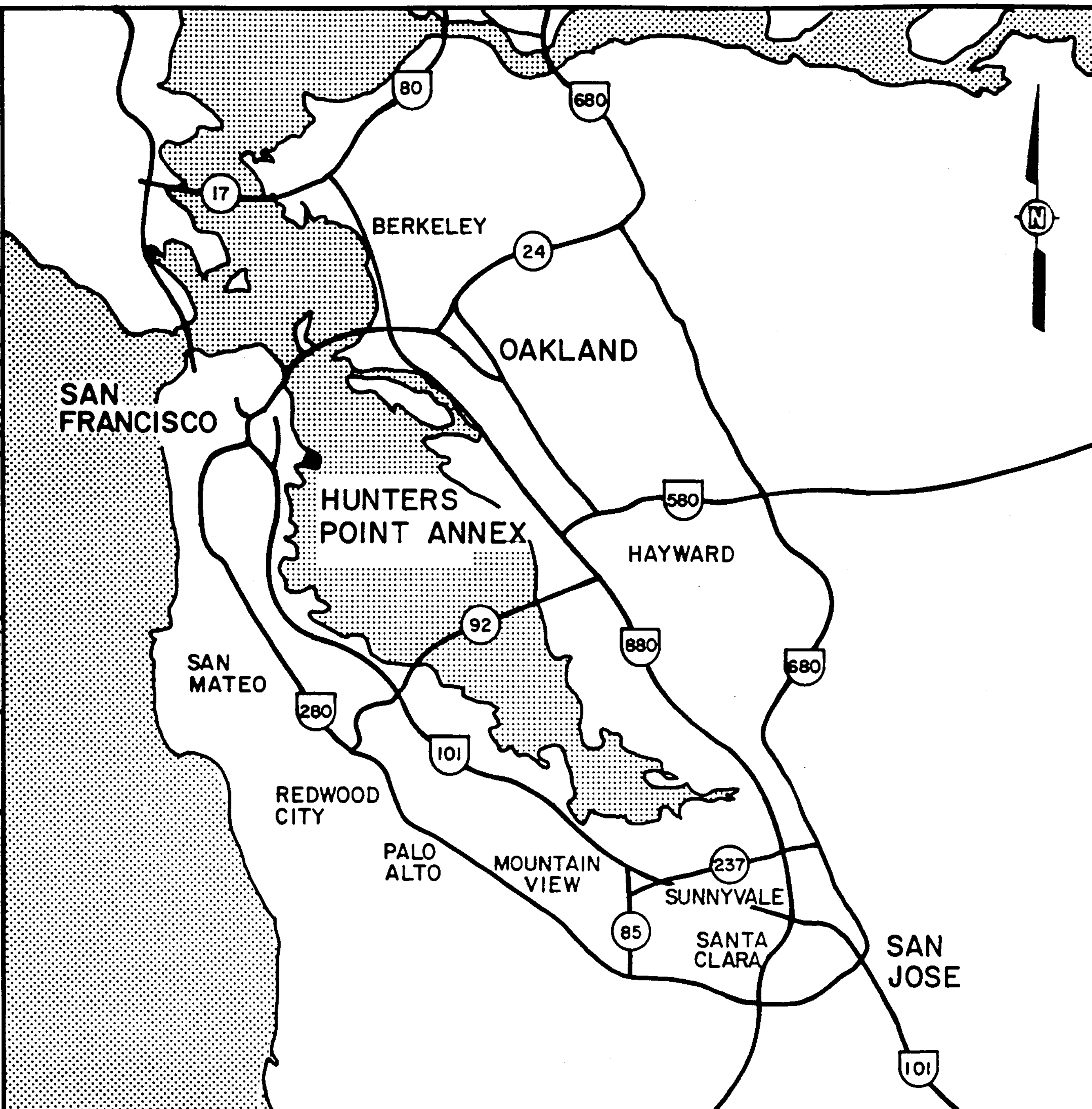

FIGURE 1-1

SITE LOCATION MAP

PREPARED FOR

NAVAL STATION TREASURE ISLAND,
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

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"Do Not Scale This Drawing

2.0 HEALTH AND SAFETY PROJECT RESPONSIBILITIES

2.1 PROJECT MANAGER

The Project Manager, John McGuire (IT Corporation, Martinez, CA) will be responsible for field implementation of the Health and Safety Plan. This will include communicating site requirements to all personnel, field supervision, and consultation with the site HSO regarding appropriate changes to the plan.

2.2 PROJECT INDUSTRIAL HYGIENIST

Dennis Robinson, CIH, Regional Manager of IT Corporation (IT) Western Region, Environmental Projects Health and Safety Division, is responsible for the development and preparation of this plan. He will also oversee the Plan's implementation. Dennis Robinson is also a member of the Project Management Team, responsible for the project health and safety audit.

2.3 HEALTH AND SAFETY OFFICER

The site acting Health and Safety Officer (HSO), John McGuire (IT Corporation, Martinez, CA), will be responsible for auditing site compliance to this plan; for providing technical support for various program elements; and authorizing changes to this plan. All changes and technical issues will be resolved with input from the Health and Safety Division. The purpose of site audits and plan coordination is to assist project management in implementation of this plan. The HSO shall interpret sampling and monitoring results to evaluate the appropriateness of the stated requirements. Also, the HSO will be responsible for addenda to the plan. The HSO will also handle regulatory agency liaison matters regarding Health and Safety. The HSO will be responsible for all on-site monitoring. Any monitoring performed by the HSO will be conducted under the guidance of the project Industrial Hygienist.

2.4 FIELD SUPERVISOR

The acting Field Supervisor, John McGuire (IT Corporation, Martinez, CA) will be responsible for ensuring that all personnel on site, including subcontractors, comply with the health and safety requirements.

2.5 TECHNICIANS/SUBCONTRACTORS

Technicians, subcontractors, and other personnel on site will be responsible for understanding and complying with all site health and safety requirements.

3.0 MEDICAL PROGRAM

3.1 PHYSICAL EXAMINATIONS

As required by ITC Policies and Procedures 9410.1 and 9410.2, all IT personnel on site will have successfully completed a preplacement or periodic/update physical examination. This examination has been designed to comply with appropriate regulatory requirements for hazardous waste site operations.

The IT Corporation medical surveillance program examination consists of:

- Medical and Occupational History Form (detailed questionnaire for new employees, short questionnaire for periodic exams)
- Physical Examination
- Complete blood count with differential
- SMAC 20 or equivalent
- Urinalysis (dipstick and microscopic)
- Chest x-ray
- Pulmonary Function Test (FEV/FVC)
- Audiogram
- Electrocardiogram for persons older than 45 years of age, or if medically indicated
- Drug and alcohol screening
- Visual activity
- Follow-up exams.

All subcontractor personnel who have potential for exposure to hazardous materials shall have successfully completed an examination similar to the preplacement physical. The cost for medical surveillance will be paid by the subcontractor. All physicals will be approved by a physician who is Board Certified in Occupational Medicine.

3.2 MEDICAL RECORDS

Medical and personnel exposure monitoring records will be maintained in accordance with the requirements of 29 CFR 1910.20. Employee confidentiality shall be maintained. These records shall be kept for 30 years.

3.3 EMERGENCY MEDICAL TREATMENT

a. Should site personnel suffer an injury or illness, the following resources will be used as necessary:

- For emergencies requiring fire, police, or ambulance, personnel contact will be arranged prior to job startup. Appropriate telephone numbers, including those listed on Table 3-1, shall be posted.

- Hospital locations and telephone numbers shall be identified prior to job start-up. They will be posted on site. Table 3-1 shows the appropriate telephone numbers. Figure 3-1 shows the location of the hospital.

b. Emergency procedures and emergency telephone numbers shall be clearly posted at the site command post, and shall be available in vehicles on site.

c. If an injury/illness clearly requires only first aid procedures, treatment can be limited to this level. All incidents not obviously limited to first aid treatment levels require the notification of medical personnel to provide more definitive medical care.

d. Any employee of IT or of a subcontractor who is suspected of having an overexposure to the chemicals on site will be given a physical examination. Any employee or contractor who develops a lost-time illness or sustains a lost-time injury will be examined by a physician. The physician will certify that the employee is fit to return to work by completing the "Return to Work Authorization Following Medical Absence Form." If necessary, activity restrictions will be specified on the "Medical Examination Report". Copies of these forms are included in Appendix A.

e. Any injury or illness will require the completion of IT Form 9300.1-1 (Appendix A), entitled "Supervisors Employee Injury Report." This form, when completed by the job supervisor, shall be forwarded to the IT Health and Safety Division as soon as possible.

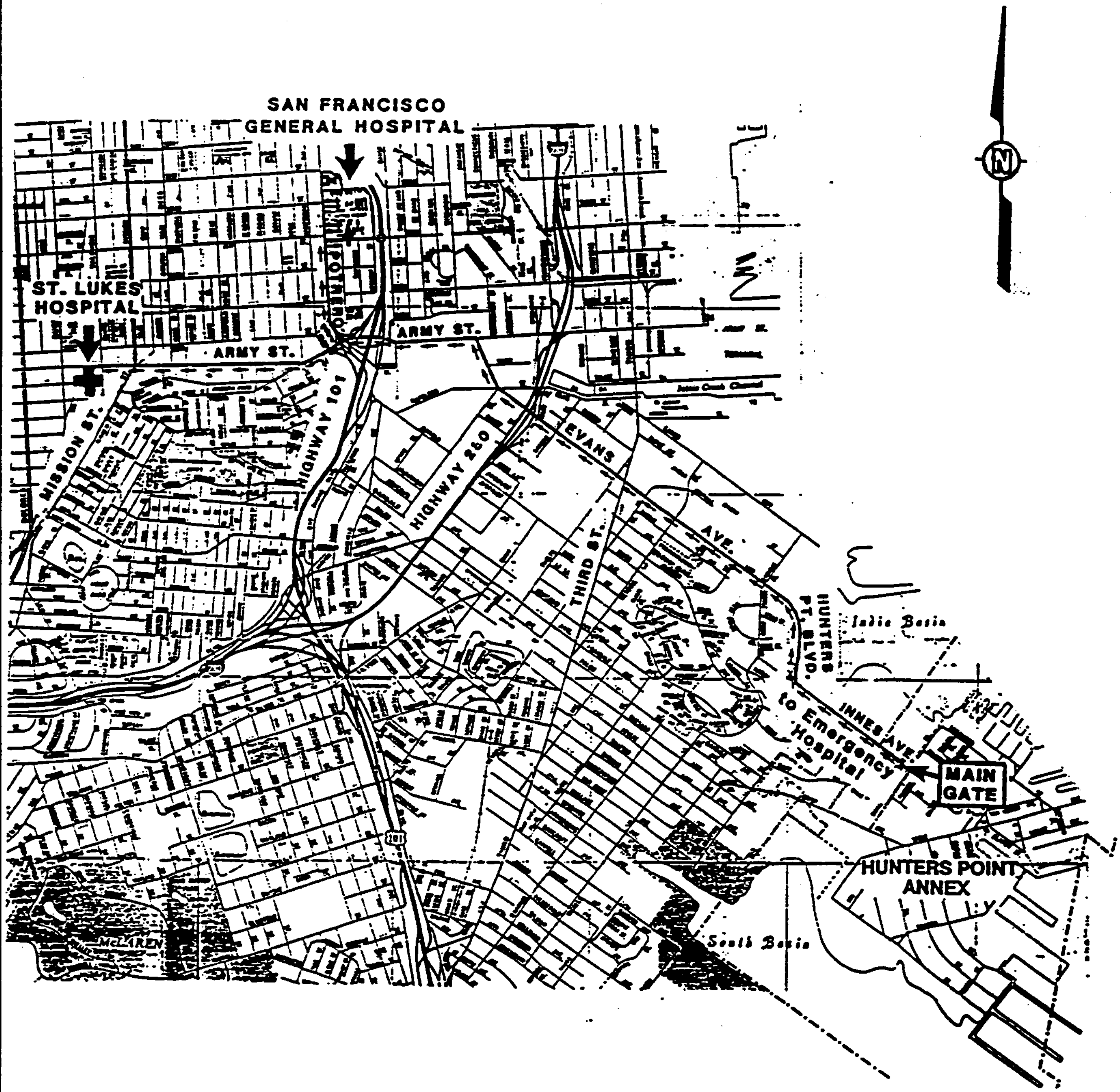
f. In addition to the above requirements, any injury/illness will require that the immediate supervisor contact the on-site HSO. This will allow coordination of internal resources to advise the treating physician of appropriate treatment. It will also permit a timely accident investigation to determine underlying causes so that appropriate corrective and preventive steps may be taken to prevent recurrence.

TABLE 3-1
EMERGENCY CONTACTS

The following is a list of contacts for the HPA project. In the event of an emergency or unexpected occurrence, the appropriate persons should be contacted as soon as possible. This list should be clearly posted in all site vehicles.

Contingency Contacts

HPA Fire Department	________________
Fire Department	(415) 822-6779 (Emergency) (415) 822-6635 (Business)
Base Security	(415) 641-2535/6056
Ambulance, Fire, Police	911
Hospital: St. Lukes Hospital 3555 Army Street San Francisco, CA (NOTE: EMERGENCY ROOM ENTRANCE IS ON SAN JOSE STREET	(415) 641-6625
St. Lukes Hospital Urgent Medical Info. 1001 Potrero Avenue San Francisco, CA	(415) 333-333
San Francisco Poison Center	(415) 821-8324
Rocky Mountain Poison Control Center	(800) 332-3073
CHEMTREC	(800) 424-9300
EPA Emergency Response Section	(415) 974-7511
Chemical Spills National Response Center	(800) 424-8802
Utility Problems: Public Works Trouble Desk	(415) 466-6171 466-6172
Officer in Charge: LCDR Thomas	(415) 822-1243
Assistant Officer In Charge 1st Lt. QMC Podvin	
Treasure Island Safety Office - Steve Hughes	(415) 765-5656
Project Manager - Navy - Alex Dong	(415) 877-7502
Project Manager - IT - John McGuire	(415) 372-9100
Health and Safety Officer - John McGuire	(415) 372-9100
Project Industrial Hygienist - Dennis Robinson	(415) 372-9100



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APPROVED BY | JPM | 4-29-88
DRAWING NUMBER | 409617-A

FIGURE 3-1

EMERGENCY ROUTE TO HOSPITALS

PREPARED FOR

NAVAL STATION TREASURE ISLAND
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

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4.0 TRAINING PROGRAM

All personnel on site who have potential for exposure to hazardous materials will attend training sessions where potential Health and Safety (H&S) hazards on the site will be communicated and individuals will receive instructions on the requirements of the H&S Plan. This training will be designed to address the requirements of OSHA Hazard Communication Standard (29 CFR 1910.1200) and the OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120).

4.1 PREPROJECT TRAINING

All field employees that may come into contact with hazardous materials in the course of their work will have received a minimum of 40 hours of initial off-site instruction. On-site supervisors shall have completed at least 8 additional hours of specialized training on managing hazardous waste operations. Each employee will also have received 3 days of closely supervised on-the-job training. This training includes familiarization with the HPA facility's safety and emergency procedures as well as a combination of several of the following training modules:

- Basic Safety Training - This course stresses fundamentals such as the cause and prevention of slip, trip, and fall hazards; safe lifting techniques; heat stress illnesses and their prevention.
- Hazard Protection - This course deals with the identification, recognition, and safe work procedures for toxic materials. The use and limitations of applicable protective clothing and decontamination procedures are an important part of this course.
- First Aid and Cardiopulmonary Resuscitation (CPR) - Some employees will have completed approved Red Cross First Aid and CPR courses. A minimum of at least one certified employee will be on site at all times. The certified employee will be identified to all personnel on-site.
- Health Hazard Awareness - Information will be available concerning on-site hazardous materials to which employees may be exposed. The information will include routes of exposure, toxic effects, appropriate protective equipment, medical surveillance, and the specific nature of jobs which could result in exposure to chemicals on site.

- Work practices and engineering controls to minimize risk.
- Hearing Conservation Program as defined in the training program.
- Personal hygiene.
- Respirator training - The use, limitations, and inspection of air purifying respirators and Self-Contained Breathing Apparatus (SCBA) will also be covered. Respirator fit tests will be given to all personnel. These tests will consist of a qualitative fit using irritant smoke in a plastic containment structure. Personnel will breath normally and heavily, move their heads up and down and from side to side, and talk while wearing the respirator in the smoke.

Refer to Section 6.0 for personnel and equipment decontamination. No confined space entries will be made during this project.

4.2 TAILGATE SAFETY MEETINGS

Daily tailgate safety meetings will be conducted at the beginning of each shift and whenever new employees or contractors arrive at the job site once the job begins. At these meetings health and safety considerations and the necessary protective equipment for the day's activities will be discussed. This meeting will be conducted by the project manager or his designee and documented on the Tailgate Safety Meeting form (Appendix A). Each employee present will sign the form.

4.3 TRAINING RECORDS

All training that is conducted will be documented on the appropriate forms and forwarded to the Training Department to be placed in the employee's file and on the site. All documentation related to Health and Safety will be recorded according to the IT Corporation Health and Safety Program.

5.0 SITE MONITORING

Site air monitoring is required to ensure adequate protection of site personnel and the environment. This information shall be used to establish the degree of respiratory protection. Significant excursions above permissible exposure limits (PELs) may require adjustments in the engineering controls or personal protective equipment being utilized.

In general, two types of industrial hygiene sampling will be conducted as described below:

- Type 1: Industrial hygiene techniques will be used for area monitoring on a periodic basis to ensure adequate protection of personnel.
- Type 2: Industrial hygiene techniques using appropriate collection media will be performed outside of the respirator and will be used for personnel (breathing zone) monitoring.

Real-time monitoring instruments, such as combustible gas meters and oxygen monitors shall be used to detect IDLH (immediately dangerous to life and health) conditions wherever and whenever such conditions are possible (such as inside storage tanks). IT Corporate policy does not allow any entry into, or work within, an atmosphere of greater than 10% L.E.L. (lower explosive limit) or less than 20% oxygen, or in any IDLH situation, regardless of ppe worn. Should IDLH conditions be encountered, no work within, or entry into, the area shall be allowed without the consent of the Project Industrial Hygienist and/or Health and Safety Officer. Such consent will be given only after IDLH conditions have been properly eliminated.

Personal exposure monitoring will be conducted by the Project Industrial Hygienist or Health and Safety Officer initially, and periodically thereafter, during activities (such as sampling or tank entry) which present a hazard of exposure to toxic air contaminants. Industrial Hygiene techniques used in the field will be specific to the contaminants being monitored (e.g., NIOSH method 1501 for benzene, utilizing charcoal tube collection media and GC-FID analysis). Analysis of samples collected will be performed at an AIHA (American Industrial Hygiene Association) accredited laboratory.

All monitoring data is to be entered in permanent log books. These books are to be maintained by IT's Health & Safety Division when complete. Personnel who have been monitored will also be notified in writing of the results and their significance. A copy of this report will also be maintained in the employee's medical surveillance file.

Monitoring results will be used to verify the adequacy of protective equipment and determine if changes are appropriate monitoring will occur in the immediate vicinity of the job site. The HSO and/or other IT Health and Safety Division staff member shall conduct periodic field audits of the various work sites to assess health and safety conditions which shall be documented in safety inspection reports. Such reports will address appropriate corrective measures where necessary. Follow-up inspections will be conducted if appropriate. A copy of inspection reports shall be maintained on site in the Health and Safety file.

A combustible gas indicator, (GSI) Gastech model GX-3A will be used for air monitoring during initial entry into contaminated areas. The CGI will be calibrated according to manufacturers guidelines. Field calibration readings will be recorded in the Daily Field Activity Logs. Unless the CGI indicates the presence of airborne contaminants, EPA level D protection (coveralls, hard hats, work boots, and safety glasses) will be required protective gear for initial entry and general field work at the start of the project. Gear requirements will be modified by the project industrial hygienist based on data obtained on-site and job requirements. If, at any time, IDLH (Immediately Dangerous to Life and Health) levels are indicated in a work area, work shall immediately cease and employees shall leave the area. This requirement holds regardless of the type of respiratory protective devices being utilized by employees at the time. References listing IDLH values for specific contaminants (such as the NIOSH Pocket Guide to Hazardous Materials) will be maintained on-site by the Health and Safety Officer to determine when such conditions exist. In addition, any concentration of contaminants greater than 10% of the LEL (lower explosive limit) and/or oxygen less than 20% will be considered an IDLH atmosphere.

6.0 GENERAL SAFETY REQUIREMENTS

All work will be conducted to comply with all applicable OSHA and Construction Industry Safety Orders. The following sections illustrate some of the more pertinent concerns.

6.1 WORK ZONES

Site conditions and planned activities do not call for the imposition of rigid access control zones. At the site of each activity (see Figure 1-1), the IT field supervisor in consultation with the HSO will implement a work zone system that is sufficient to limit employee exposure and prevent the dispersion of hazardous components. This will consist of clarifying:

- Where/when protective clothing must be worn
- Where protective clothing will be donned
- Where protective clothing will be removed
- What must be done with contaminated protective clothing.

However, if on-site conditions change so that an area(s) becomes heavily contaminated, work zones around the site(s) shall be more rigidly defined. The work site will be divided into the Exclusion, Decontamination, and Support Zones and clearly marked. At each site during ongoing work activities warning barricade tape will be suspended approximately two feet above the land surface and emcompass the two inner zones (Exclusion and Decontamination zones).

This plan was written to accommodate anticipated site conditions based upon known tank history. The protective equipment used during the sampling of the tank contents, goggles, nitrile gloves, coveralls or equivalent, will provide sufficient protection against exposure to any chemicals.

6.1.1 Exclusion Zone

This zone includes areas of potential contamination and poses the highest inhalation and skin exposure potential (level). Appropriate respiratory and skin protection will be required for anyone entering the Exclusion Zone. Decontamination will be required for all personnel and equipment leaving this area.

6.1.2 Decontamination Zone

This zone includes the area immediately surrounding the Exclusion Zone. This zone shall be at the interface of the Exclusion Zone and the Support Zone and shall provide for the decontamination of equipment and personnel before crossing into the Support Zone.

6.1.3 Support Zone

This zone covers all areas outside of the Decontamination Zone. This area is considered to have no significant air, water, or soil contamination. The Support Zone provides a changing area for personnel entering the Decontamination and Exclusion Zones.

6.1.4 Decontamination Station

The decontamination station shall be positioned at the entrance to the decontamination zone with a step-off area just inside the contamination reduction zone. All personnel entering or leaving the site shall pass through these areas to don or doff the appropriate protective equipment. Disposable booties, if required, will be provided for those personnel exiting through the station into the clean zone from the contaminated reduction zone contaminated material will be placed in drums for proper disposal.

At least one emergency shower/eyewash station shall be established where there exists the potential for splashes of corrosive liquids. This unit shall be placed near the decontamination station. Portable units may be placed on-site if specific needs are identified. Sampling containers will be wiped clean prior to their leaving the decontamination station. All protective clothing worn on-site will be of the disposable variety. Boots will be wiped clean and/or washed prior to leaving the decontamination area.

6.1.5 Personnel Decontamination

No personnel protective equipment worn on site will be worn off site without prior decontamination or proper disposal. All site personnel shall utilize a step-off decontamination sequence whenever they leave the exclusion and decontamination zones. Should site conditions require the level of protection to be upgraded, the decontamination procedures will be modified by the project HSO.

The Decontamination Zone at all of the sites shall include suitable receptacles for the disposal of used protective clothing, respirator cartridges, plastic sheeting, etc. Polyethylene bags may be used for this purpose. Contaminated protective clothing and equipment will not be removed from the decontamination area until it has been properly bagged. Daily and/or at the end of each shift all used protective equipment will be sealed in the bags provided. Each bag containing used protective clothing and equipment will be placed into new DOT 17-H drums and may be commingled with similar materials from the same, or other, sites. Predisposal analysis of the drum contents is not necessary and will be disposed of at an appropriate licensed disposal site.

6.1.6 Sanitation

Potable water will be obtained from HPA and will be available to all personnel. Potable water will be clearly marked and stored in clean, insulated, 5-gallon water coolers. Potable water will be located near and/or in the site Support Zone. Single use paper cups will be available adjacent to the coolers. Cups will be disposed of into plastic garbage bags to be placed into an on station dumpster or refuse container.

6.1.7 Toilet Facilities

Varied work activities may be in progress concurrently at more than one site throughout HPA. The location of the nearest toilet will be provided each morning at the Tailgate Safety meeting.

6.1.8 Washing Facilities

Adequate facilities for washing hands will be available at the decontamination station at each work site. Rubberized plastic wash tubs, tubes of hand cream, rinse water, and paper towels for drying are sufficient. Hands and face will be washed prior to eating or drinking and before leaving the site at the end of each shift. Rinse and wash water will be commingled with other used decontamination waters.

6.1.9 Equipment Decontamination

Prior to entering a new drill site, the drilling rig and support vehicles will be cleaned of soil or mud adhering or accumulated on the equipment. Augers and other sampling equipment used will be decontaminated by a thorough cleaning with high pressure steam. In addition, the aforementioned equipment including hand tools will be scrubbed with a soft bristle brush and a low alkaline nonphosphate detergent solution followed by a double rinse with treated drinking (or deionized) water.

6.1.10 Breaks

All breaks must be taken in a shaded, clean area. Employees shall wash their hands and faces with soap and water and go to an appropriate break area. Employees are encouraged to drink plenty of fluids during breaks.

6.2 EXCAVATION SAFETY

All excavation work will comply with the applicable sections of 29 CFR 1926 Subpart P, as well as the following general guidelines:

- No employee shall work adjacent to any excavation until a reasonable examination of same has been made to determine that no conditions exist exposing them to injury from moving ground.
- Trees, boulders, and other surface encumbrances, located so as to create a hazard to employees involved in excavation or in the vicinity thereof at any time during operations, shall be removed or made safe before excavating is begun.
- Excavations shall be inspected by an IT qualified person after every rainstorm or other hazard-increasing occurrence, and the protection against slides and cave-ins shall be increased if necessary.
- Employees shall not enter a excavation alone.

6.3 GENERAL REQUIREMENTS

a. As appropriate, equipment on site shall be bonded and grounded, spark proof, and chemically compatible.

b. A tailgate safety meeting shall be conducted at the beginning of each shift and whenever new personnel arrive, or when a unique work assignment warrants employee indoctrination and training. Tailgate safety meetings are to be conducted by the supervisor, a safety representative, or other qualified person.

c. A qualified person shall take positive steps to ensure that employees are protected from physical hazards, which would include, but are not limited to, the following:

- Insufficient or faulty personal protective equipment
- Insufficient or faulty operations equipment and tools
- Noise in excess of acceptable levels (noise protection will be provided, i.e., ear plugs)
- Tripping over hoses, pipes, tools, or equipment
- Slipping on wet or oily surfaces
- Appropriate action to provide secure footing shall be taken at all locations where personnel will be working.

d. Legible and understandable precautionary labels shall be prominently affixed to containers of raw materials, intermediates, products, by products, mixtures, scrap, waste, debris, and contaminated clothing.

e. Employees shall not be permitted to exit the regulated area until contaminated clothing and equipment have been removed.

f. Contaminated protective clothing and equipment shall not be removed from the regulated area until it has been cleaned or properly packaged (double plastic bagged) and labeled.

g. Removal of materials from protective clothing or equipment by blowing, shaking, or any other means which may disperse materials into the air is prohibited.

h. Eating, drinking, and smoking shall be restricted to areas within the clean zone.

i. All employees shall be required to wash their face, hands, and forearms with soap and water before eating, drinking, smoking, or applying cosmetics.

j. Field personnel must observe themselves and each other for signs of toxic exposure. Indications of adverse effects include, but are not limited to:

- Changes in complexion and skin color
- Changes in coordination
- Changes in demeanor
- Excessive salivation
- Abnormal pupillary response
- Changes in speech pattern.

k. Field personnel shall be instructed to inform their supervisor of any non-visual effects of toxic exposure such as:

- Headaches
- Dizziness
- Nausea
- Blurred vision
- Cramps
- Irritation of eyes, skin, or respiratory tract

- Any other abnormal physiological functions.

l. Eating, drinking and tobacco use will be restricted to the rest area.

m. Fall protection shall be required for any work surface higher than six feet. This may be either fall barriers with toe guard, or safety belts with lanyard.

n. All construction equipment shall have automatic back up alarms, seat belts and Roll Over Protective Structures (ROPS).

o. No cranes shall be operated within ten feet of live electrical conductors. Rated load capacities shall not be exceeded.

p. Unless double insulated, all electric tools shall be properly grounded.

q. Safety glasses and face shields are mandatory for all personnel using tools which may eject flying particles or fragments. Examples of such tools are grinders, sanders, saws etc.

6.4 PROTECTIVE EQUIPMENT REQUIREMENTS

6.4.1 Personal Protective Equipment.

Requirements for personal protective equipment will be established via task assignment and location. The following requirements will be implemented.

- The protective clothing requirements for tank inspection and sounding, tank atmosphere testing, tank entry and tank interior purging have been outlined in Section 7.0. During project activity the project industrial hygienist, in conjunction with the HSO shall continue to evaluate whether the outlined requirements are adequate.

- All personnel and visitors on site shall be required to wear hard hats, except when in offices. Steel-toe footwear shall be required for personnel in construction areas.

- All construction equipment operators shall be required to wear hard hats, steel-toe boots, and hearing protection, unless noise monitoring indicates noise levels below current permissible levels. Where there exists a significant potential for skin contact with toxic substances, operators may be required to wear neoprene boots and gloves and coated protective clothing. In unusual circumstances, respiratory protection may also be needed. The project industrial hygienist shall make these field determinations and will also decide on the need for hearing protection.

The personal protective equipment assignments listed in this document have been established based on the hazards which may be anticipated from the limited information available on the contents and conditions of the various storage tanks. Though the proper personal protective equipment required on-site varies with the task to be performed, specific PPE assignments will be made by the Project Industrial Hygienist and on-site Health and Safety Officer. Assignments will be based on industry safety practices and IT Corporate policies (e.g., tasks presenting any potential for chemical contact with the eyes will require either goggles or a full-face respirator be worn). Changes in the required personal protective equipment may only be implemented after approval by the Project Industrial Hygienist or on-site Health and Safety Officer.

6.4.2 Respiratory Protection.

All respirators shall be used and maintained in accordance with established procedures. These procedures include written operating procedures governing the selection and use of respirators, and procedures for the selection, instruction and training, cleaning and sanitizing, inspection and maintenance of these respirators. Taken together, these procedures comply with 29 CFR 1926.103 and 29 CFR 1910.134. The following requirements shall be adhered to.

- Properly cleaned, maintained, NIOSH-approved respirators shall be used.
- Selection of respirators shall be reviewed with the IT Health and Safety Division.
- Employees wearing air-purifying respirators shall be required to change filter elements whenever an increase in breathing resistance or breakthrough is detected.
- Personnel protective equipment for entry into any excavation or trench shall be established according to tests and inspections performed by a qualified individual.
- An inhalator and resuscitator shall be available in the contamination reduction zone standby area. This equipment is to be used only by CPR-trained individuals.

6.5 HEAT STRESS

Adverse climatic conditions - heat and cold - are important considerations in planning and conducting site operations. Ambient temperature effects can include physical discomfort, reduced efficiency, personal injury, and increased accident probability. Heat stress is of particular concern while wearing protective garments, since these garments prevent evaporative body cooling.

6.5.1 Heat Stress Control Measures.

The wearing of protective clothing in warm environments creates a heat stress potential. One or more of the following control measures can be used to help control heat stress.

- Provision of adequate liquids to replace lost body fluids. Employees must replace water and salt lost from sweating. Employees must be encouraged to drink more than the amount required to satisfy thirst. Thirst satisfaction is not an accurate indicator of adequate salt and fluid replacement. Electrolyte replacement fluids such as Gatorade or Quik--Kick, or a combination of these with fresh water will be available for use as necessary. Employees will be encouraged to slightly increase their sodium intake.

- Establishment of a work regime that will provide adequate rest periods for cooling down. This may require additional shifts of workers. Heat stress measurements shall be compared to the ACGIH Heat Exposure TLVs for work/rest regimens, with special consideration given to the WBGT modification factors for protective garments.

- Cooling devices such as vortex tubes or colling vests can be worn beneath protective garments.

- All breaks are to be taken in a cool rest area (77°F is best) and a shaded area will be provided if none exists.

- Employees shall remove protective garments during rest periods

- Employees shall not be assigned other tasks during rest periods.

- All employees shall be informed of the importance of adequate rest and proper diet in the prevention of heat stress.

6.6 SITE SECURITY

a. A controlled access to the regulated area(s) shall be established. Access to regulated areas shall be restricted by the use of barricades and barricade tape with signs at regular intervals indicating "contaminated area-keep out". Access to the exclusion zone will only be possible through the step-off/decontamination station.

b. Only authorized personnel shall be permitted to enter the regulated area(s). Authorization shall be granted by a Navy representative or by the IT Project Manager. All personnel entering the site shall use the "buddy system". At no time will only one person be allowed within the exclusion zone.

7.0 SPECIFIC HAZARD EVALUATION AND SAFETY CONSIDERATIONS

This section evaluates safety conditions, procedures and required protection associated with specific project activities. The considerations and procedures are in addition to those detailed in Section 6.0.

7.1 TANK INSPECTION AND SOUNDING

Prior to clean-out, atmosphere purging, and content disposal, each tank will be inspected and sounded. Visual inspections of interiors shall be made through manholes and inspection ports. No tank entry shall occur at this stage. Tank content shall be sampled by coliwasa or other appropriate means. To minimize skin contamination, protective clothing consisting of polyethylene coated Tyvek, PVC boots and gloves and face shields mounted on hard hats shall be worn when prescribed by the on site HSO. Prior to inspection and sampling, access shall be assessed to evaluate fall, slip or trip hazards. The inspection/sampling supervisor shall document such hazards on the tailgate safety meeting form at the beginning of each day.

7.2 TANK INTERIOR EXPLOSIVE ATMOSPHERE TESTING

As required by IT confined space procedures, a combustible gas indicator shall be used to test tank interior atmospheres for flammable atmosphere and oxygen deficiency after the tank has been emptied. If the testing reveals any airborne hazard, mechanical ventilation shall be used to abate the hazard. Entry into confined space will not be permitted unless the flammable contents are at less than 10 percent of the Lower Explosive Limit (L.E.L.) and the oxygen content is greater than 20 percent. The presence of volatile hydrocarbons shall also be evaluated to determine the level of respiratory protection needed. This includes the posting of an entry permit documenting testing, blinding/locking out of all lines and electrical equipment, appropriate protective clothing, and names of employees entering the vessel. Additionally, a first aid/CPR trained standby person shall be available at the tank entryway for emergency response. Where top entry is necessary, ladders of adequate length and extraction devices shall also be used.

The following protective equipment is anticipated to be necessary for tank entry, since no analytical data is available at this time for more accurate evaluation. The HSO will be responsible for supplying employees with all new information obtained.

- PVC boots with steel toe and shank (with metatarsal guards if hydroblasting)
- PVC gloves
- PVC rain gear (heavy duty)
- Airline respirator
- Lifeline and harness
- Hard hats
- Faceshields (for hydroblasting)
- Self-contained breathing apparatus (for standby person)
- Extraction device (for top-entry vessels)

The air for Airline respirators shall be provided from a cascade arrangement of 300 SCF cylinders containing grade D breathing air.

7.3 TANK INTERIOR PURGING

Where interior tank testing has shown mechanical ventilation to be necessary, the tank interior shall be purged by such means. The fans shall be powered by compressed air, and shall be bonded to the tank to control the build-up of static electricity. Care shall be taken to ensure the tank is ventilated such that personnel in the vicinity are not exposed through the use of the CGI, and to avoid inefficient ventilation. Ignition sources, such as vehicles and compressors, shall not be stationed within 50 feet of the exhaust area of the tank. The tank interior shall be tested periodically to measure progress, after the fans have been shut off. Compressors used to power the fans shall be evaluated for noise, and if necessary, hearing protection will be required.

The tank atmosphere inerting will be achieved by introducing solid carbon dioxide into the tank, and allowing it to evaporate so it displaces the air. Solid carbon dioxide shall be handled with gloves so as to avoid any skin contact to prevent cold burns. After purging the tank interior, no entry will be permitted.

7.4 TANK CONTENT DISPOSAL

Since tank contents will be pumped into temporary containers or vacuum trucks, personnel exposure is anticipated to be minimal. Nevertheless, employees handling contaminated hoses shall wear the following minimum protective equipment:

- Polyethylene-coated Tyvek protective clothing
- PVC boots with steel toe and shank
- PVC gloves
- Safety glasses.

All pumping equipment shall be bonded and grounded to control any static electricity.

7.5 TANK REMOVAL AND DISPOSAL

After each tank has been cleaned and purged, it shall be removed. The health and safety aspects of such work will depend on the size and nature of the tank. If underground, totally or partially, it will be necessary to excavate. In such event of excavation, all the requirements of 29 CFR 1926 and IT Policy and procedure 9532.4 for excavation safety shall be used. Prior to beginning excavation, all neighboring underground utilities shall be located, and locked out of use.

Sloping, shoring or benching will be used if excavation depth exceeds five feet and employees are required to enter the excavation. Excavation spoils shall be kept no closer than three feet from the edge. Exit ladders shall be placed no farther than twenty-five feet apart for appropriate egress. Each day prior to commencing work, the field supervisor shall inspect the excavation for water accumulation or potential hazards associated with moving soil. Additional safety procedures are specified in IT policy and procedure 9532.4B.

All excavation equipment and crane operators shall have successfully completed appropriate training to ensure they can operate such equipment safely.

The need for protective clothing and equipment will depend on the extent of contamination external to the tank. The site HSO shall determine the appropriate level of protection needed, in concert with the Project Industrial Hygienist overseeing the implementation of this plan. To assist in determining appropriate respiratory protection, air shall be sampled using direct reading methods such as a photoionization detector, or colorimetric indicator tubes. EPA level D protection is anticipated to be the highest level needed, although field circumstances may require a higher degree of protection.

At the start of each day a tailgate safety meeting will be held to discuss the use of personal protective equipment use, chemical and physical hazards present.

After the tank has been removed, it may be necessary to perform hot work on it, such as cutting it into manageable sizes. Where such work is needed, appropriate fire control precautions such as outlined in IT policy and procedure 9571.1 shall be taken. This document outlines requirements pertaining to hot work in hazardous locations.

7.6 <u>SOIL/WATER SAMPLING</u>

Prior to initiating such activities, the site HSO shall determine the potential chemical and physical hazards to prescribe appropriate measures. Level D protection is the highest anticipated need, but this will depend on the nature of the site to be sampled and the extent of contamination therein.

Prior to sampling, the sampling supervisor, with the assistance of the site HSO, shall review health and safety hazards and appropriate personal protective equipment with the sampling crew during the tailgate safety meeting at the beginning of each day.

7.7 SOIL EXCAVATION, AERATION, AND DISPOSAL

Where contaminated soil must be removed, all appropriate excavation procedures as outlined above and as specified in OSHA regulations, and IT Policy and Procedure 9532.4 shall be followed.

Where soil aeration is necessary, air monitoring will be performed to determine the need for respiratory protection. Personal protective clothing selection shall be based on the analytical results on which the need for aeration is based. It is anticipated that EPA level D will be the highest degree of protection needed, but this will be corroborated by field results, which the Project Industrial Hygienist shall interpret. Soil excavated during drilling will be placed in appropriate Department of Transportation (DOT) drums pending the results of analytical data. Final disposition of drummed material will be determined once the analytical data is received.

7.8 DRILLING AND MONITORING WELL INSTALLATION

It is anticipated that EPA Level D will be the highest level of protection required for the drilling and well installation phase of this project. Personnel shall wear the following protective clothing:

- Hard hats
- Safety glasses
- Steel-toed safety boots with steel shanks
- PVC or leather gloves, as appropriate.

8.0 EMERGENCY PROCEDURES

The H&S Plan has been established to allow site operations to be conducted without adverse impacts on worker health and safety. In addition, supplementary emergency response procedures have been developed to cover extraordinary conditions that might possibly occur at the site.

8.1 GENERAL

All incidents will be dealt with in a manner to minimize adverse health risk to site workers. In the event an incident occurs, the following procedure will be followed:

- First aid or other appropriate initial action will be administered by properly trained personnel who are closest to the incidents. This assistance will be conducted in a manner to ensure that those rendering assistance are not placed in a situation of unacceptable risk.
- All incidents will be reported to the field operations supervisor. The field operations supervisor is responsible for coordinating the emergency response in an efficient, rapid, and safe manner. He will decide if off-site assistance and medical treatment are required and will arrange for assistance.
- All workers on site are responsible for conducting themselves in a mature, calm manner in the event of an incident. All personnel must conduct themselves in a manner to avoid spreading the danger to themselves or surrounding workers.

The following emergency equipment will be available at the work site:

- First-aid kit (one in each vehicle, and a permanent first aid station at the decontamination area as a minimum).
- Fire extinguisher and blanket.
- Pressurized eye wash.

The location of the emergency equipment will be identified to all employees each morning at Tailgate Safety meetings. Evacuation evacuation rates nd maps to local hospitals will be posted at the job site and discussed in Tailgate Safety meetings.

At least one individual currently trained in administering first aid care and cardiopulmonary resusitation (CPR) will be on-site at all times. Additional first-aid qualified individuals will be assigned as needed to fulfill IT Corporate Safety policies (e.g., during any confined space entry, a stand by person currently qualified in both first aid and CPR will be assigned). Only those employees who possess a currently valid first aid/CPR card from the American Red Cross (or similar organization) may administer first aid or CPR at the job site.

Because of the relatively low toxicity of the wastes being handled, workers injuries may occur for which first aid treatment may necessitate a modified (or deleted) decontamination procedure prior to treatment. An example of this situation might bve a worker suffering from heat stroke while conducting air monitoring within the exclusion zone. Individuals certified in first aid application under IT policy have been trained to recognize such situations and will act accordingly. The appropriate situations for such modified decontamination procedures will be reviewed in Tailgate Safety meetings. If an accident should occur, the work area will be secured until the exact cause of the accident is determined and corrected.

Should a large scale incident occur, a project emergency response team, lead by the project manager, shall take immediate action to no further harm occur to either workers at the job site or nearby personnel. The project manager shall direct response activities from a safe location upwind from the incident. The project manager shall receive guidance from the Health and Safety Officer or Industrial Hygienist to assist him in deciding proper actions in response to the particular situation at hand.

Project supervision will be responsible for performing any mitigative actions required in a safe and timely fashion. Supervisors will report directly to the project manager in any emergency. At no time will project personnel be asked to endanger their own safety to mitigate an incident. In most foreseeable situations, the project work force would simply be told to leave the hazardous area to an upwind location until the situation stabilized itself. Smaller scale incidents (such as small fires or chemical spills) could be mitigated by work crews under the supervision of project management.

In the unlikely event that there is an emergency which could affect the health of the community, the HSO will notify the HPA Environmental Coordinator, Kam Tung. Prior to the initiation of work at each site, the environment will be monitored for the presence of explosive vapors and oxygen. This will be done using a combustible gas indicator, which measures the percent of oxygen in the atmosphere and the lower explosive limit (LEL) of any flammable vapors. No work will begin until both readings are within the acceptable ranges for work (i.e., O_2=21%, LEL <10%).

8.2 RESPONSES TO SPECIFIC SITUATIONS

Emergency procedures for specific situations are given in the following paragraphs.

8.2.1 Worker Injury

If an employee working in a contaminated area is physically injured, established first-aid procedures will be followed. Depending on the severity of the injury, emergency medical response may be sought. If the employee can be removed, he/she will be removed from the source of contamination. Decontamination procedures, additional first aid, or preparation for transportation will be conducted at a safe distance from the work site. Procedures governing emergency medical treatment of project personnel are discussed in Section 3.3.

If the injury to the worker is chemical in nature (e.g., overexposure), the following first-aid procedures are to be instituted:

- Eye Exposure - If contaminated soils or liquids get into the eyes, wash eyes immediately at the emergency station using large amounts of potable water and lifting the lower and upper lids occasionally. Wash for at least 15 minutes. Obtain medical attention immediately thereafter. Contact lenses will not be worn when working on the site.
- Skin Exposure - If contaminated solids or liquids get on the skin, promptly wash the contaminated skin using soap or mild detergent and water for at least 15 minutes. Obtain medical attention immediately thereafter when exposed to concentrated solids or liquids. Wash face and hands prior to eating or leaving the site.
- Accidental Ingestion - Due to the relatively low toxicity of the wastes being handled, vomiting is not to be induced. Should

accidental ingestion of work occur, the project industrial hygienist will be contacted to determine if any other actions are needed.

Through hazardous waste materials are exempt from worker safety laws requiring MSDSs (Material Safety Data Sheets), to the extent possible, MSDSs will be maintained on-site for the wastes known to be present in the work area. In most instances, MSDSs for similar products will be considered adequate when the specific manufacturer's MSDS for the mixture of concern is not available (e.g., a "generic" fuel oil MSDS will be allowable if the manufacturer's is not). MSDSs will be obtained by the project manager and reviewed by the Project Industrial Hygienist or Health and Safety Officer for adequacy.

8.2.2 Fires

As a fire prevention measure, no smoking or fires are permitted wherever there may be dry grass or other flammable material, or wherever HPA specifically forbids such practice. Vehicles and equipment will not be left idling or parked in or around areas where catalytic converters may cause grass fires.

Hot work such as welding or cutting shall be performed only as absolutely necessary. Hot work shall only be conducted after issuance of a hot work permit, which will require appropriate site inspection for fire hazards. At least two appropriate fire extinguishers shall be readily available during hot work procedures. If hot work is required in areas where HPA procedures prohibit it, prior clearance shall be obtained in writing from HPA. A hot work permit shall still be required in such instances.

Multi-purpose chemical (A:B:C) fire extinguishers will be provided. If a localized fire breaks out, dry chemical fire extinguishers will be used to bring the occurrence under control. If necessary and feasible, a fire blanket, soil, wastes, or other inert materials may be placed on the burning area to extinguish the flames and minimize the potential for spreading. The HPA fire department will be notified of any and all fires and will be contacted for assistance as required.

If an uncontrolled fire develops potentially releasing toxic gases, all persons in the immediate vicinity will be evacuated. Contact with the HPA fire department will be made immediately to notify them of the materials involved.

8.2.3 Spills

Handling procedures have been developed to limit potential problems with material spillage. In the event of a spill at the site, the area will be isolated from traffic by the field operations supervisor. Spilled solids and any PPE will be removed and loaded into appropriate containers for subsequent placement or take to original destination. Liquid spills will be contained with absorbent material and then the absorbent will be loaded into appropriate containers for disposal. The appropriate HPA personnel will be notified.

8.3 NOTIFICATION

Maps showing routes to the nearest hospital will be located in support vehicles and locations at the site along with emergency phone numbers, also a list of persons with CPR/First Aid Training.

In the event of an on-site emergency, the field operations supervisor is responsible for immediately notifying the HPA personnel.

APPENDIX A

FORMS

IT CORPORATION

RETURN TO WORK AUTHORIZATION
FOLLOWING MEDICAL ABSENCE

_______________ Date

To: _______________

Division: _______________

Location: _______________

_______________ has been absent from work due to a:

☐ work related illness or injury _______________ (date of injury)

☐ nonindustrial illness or injury

☐ other

and has provided a satisfactory medical release certificate for:

☐ return to work, without restriction

☐ return to work subject to the attached "Physical Activity Restriction"*

____
Health & Safety Department

*For "Physical Activity Restriction":
1. Have employee read and sign restriction
2. Provide manager signature
3. Return form intact to the Health & Safety Department

INTERNATIONAL TECHNOLOGY CORPORATION

MEDICAL EXAMINATION REPORT

To: ______________________ ______________________ Date ____________
(Supervisor) (Location)

On ______________________ , ______________________ received the appropriate:
(Date of Exam) (Employee's Name)

- ☐ Preemployment examination
- ☐ Periodic examination
- ☐ DOT/DMV examination
- ☐ Drug Screen
- ☐ Other ______________________

and has been found to be:

- ☐ Acceptable; no restriction.
- ☐ Not Acceptable
- ☐ Acceptable; subject to the following "Physical Activity Restriction"

____

Health and Safety Representative

To be completed for Physical Activity Restrictions Only:

- ☐ Acceptable for work under Physical Activity Restriction stated above.
- ☐ Not acceptable for work under Physical Activity Restriction stated above.

______________________ ______________________

Manager's Signature Employee Signature

580-10-87

INTERNATIONAL TECHNOLOGY CORPORATION

SUPERVISOR'S EMPLOYEE INJURY REPORT

This is an official document to be initiated by the employee's supervisor. Please answer all questions completely. This report must be forwarded to the employee's Regional Health and Safety office within 24 hours of the injury.

Injured's Name ______ Sex ____ S.S. No. ______ Birthdate ______

Home Address ______ City ______ State ______ Zip ______ Phone ______

Job title ______ Employee's P.C. ______ Hire date ______ Hourly wage ______

SUPERVISOR

Date of incident ______ Time ______ Time reported ______ To whom? ______

Client name ______ Client address ______ Time shift began ______

Exact location of incident ______ Did employee leave work? ☐ No ☐ Yes When ______

Has employee returned to work? ☐ No ☐ Yes When ______ Did employee miss a regularly scheduled shift? ☐ No ☐ Yes

Doctor/Hospital name ______ Address ______

Witness name(s) ______ Statements attached? ☐ No ☐ Yes

Nature of injury ______ Exact body part ______

Medical attention: ☐ None ☐ First aid on site ☐ Doctor's office ☐ Hospital ER ☐ Hospitalized

Job assignment at time of incident ______ Job: ______ Phase: ______ Task: ______ Subtask: ______

Describe incident ______

What unsafe physical condition or unsafe act caused the incident? ______

What corrective action has been taken to prevent recurrence? ______

Supervisor/Foreman ______ (Print) ______ Signature ______ Date

MANAGER

Comments on incident and corrective action ______

Manager's name ______ (Print) ______ Signature ______ Date

HEALTH AND SAFETY

Concur with action taken? ☐ No ☐ Yes Remarks ______

OSHA Classification:

☐ Incident only ☐ First aid ☐ No lost workdays ☐ Lost workdays ☐ Restricted activity ☐ Fatality

Days away from work ______ Days restricted work ______ Total days charged ______

☐ State jurisdiction ☐ Federal L&H ☐ Date ER submitted ______ Which claims office ______

Coding: A. Injury type or illness ______ B. Injured body parts ______ C. Activity at time of accident ______ D. Injury cause code ______

E. Agent code ______ F. Safety rule violated code ______ G. Accident prevention code ______

Name ______ (Print) ______ Signature ______ Date

ITC FORM 9300.1-1 (07/86)
Refer to ITC PRO 9300.1 for reporting procedures

White: Corporate Health and Safety Yellow: Regional Health and Safety Pink: Profit/Cost Center

80A-9-85

IT TAILGATE SAFETY MEETING

Division/Subsidiary ______________________ Facility ______________________

Date ______________ Time ______________ Job Number ______________

Customer ______________________ Address: ______________________

Specific Location ______________________

Type of Work ______________________

Chemicals Used ______________________

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment ______________________

____

Chemical Hazards ______________________

____

Physical Hazards ______________________

____

Emergency Procedures ______________________

____

Hospital / Clinic ______________ Phone (   ) ______________ Paramedic Phone (   ) ______________

Hospital Address ______________________

Special Equipment ______________________

____

Other ______________________

____

ATTENDEES

NAME PRINTED	SIGNATURE

Meeting conducted by:

______________________ ______________________

NAME PRINTED SIGNATURE

Supervisor ______________________ Manager ______________________

ITC Form 9540-1C (Revised 10/84)